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Item 16

Benjamin Rush

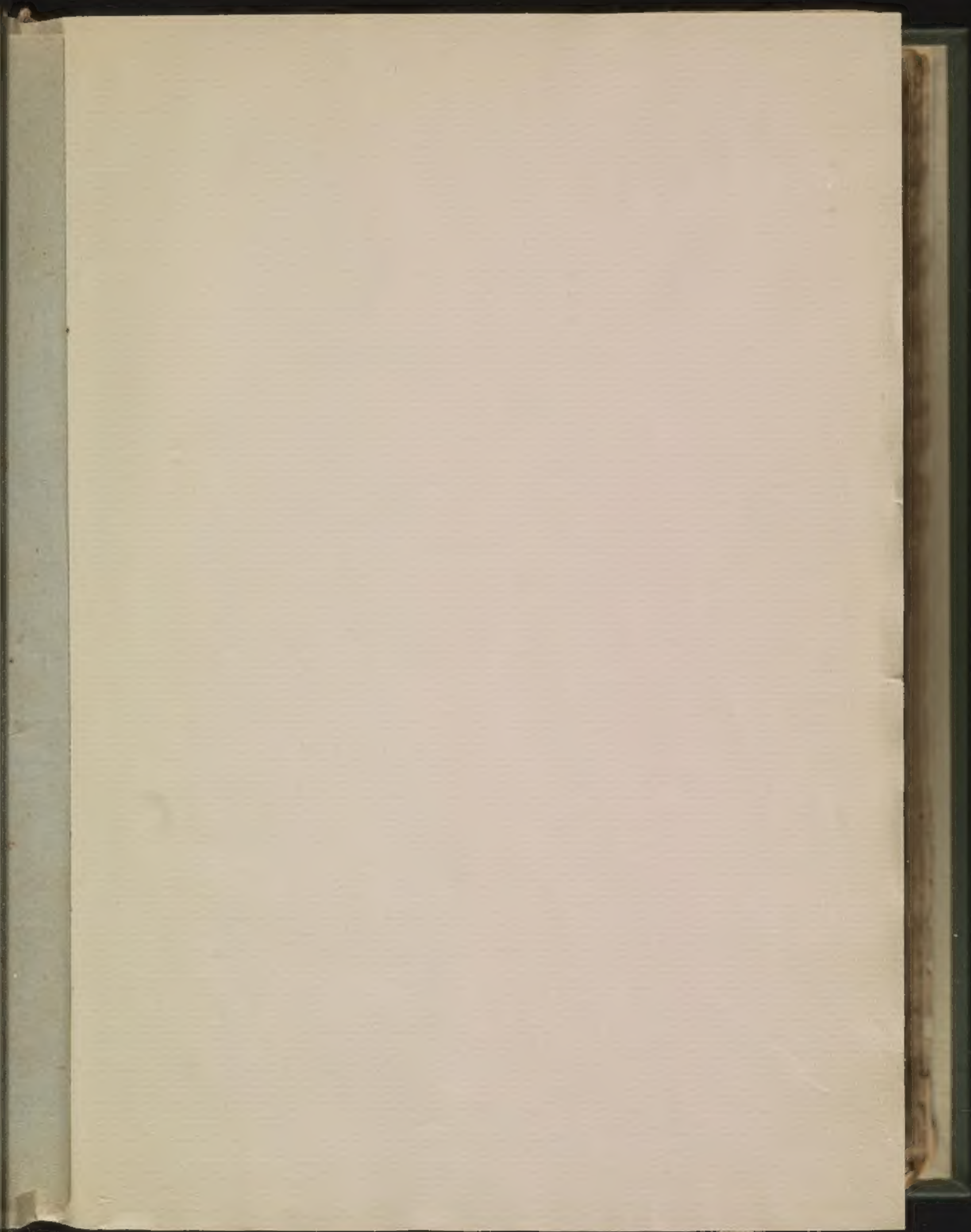
Lectures on Chemistry

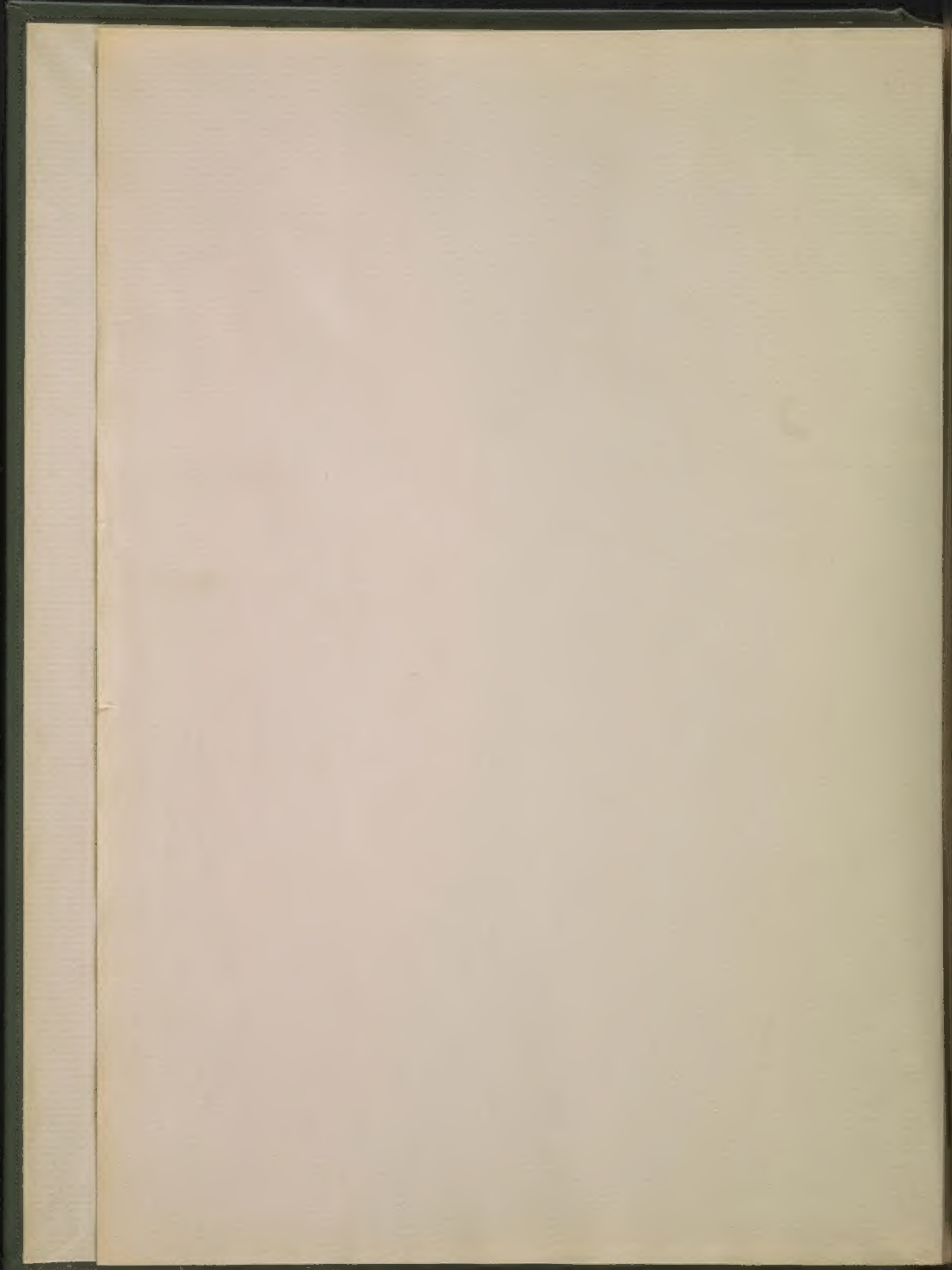
&

the Theory & Practice

of Medicine (Manuscript)

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Introductory Lecture.

Gentlemen,

I once more have the honor of
addressing you previously to a course of lectures
on Chemistry and the Theory and the practical
use of medicine. In this lecture I shall en-
deavor to shew the objects importance and
usefulness of Chemistry. The Professors of
every science have thought that the most
ancient the origin of that science could be
placed the more dignity it possessed Chem-
istry therefore has had its origin placed in the
times of the most early antiquity. Thus Noah con-
sidered in Scripture as versed in many
the art of making wine and Tubal Cain
who was a worker in brass have been said
to have been expert Chemists. In my opinion
Chemistry instead of being the most ancient
is the most modern of the sciences. The Per-
sons who say otherwise do not distinguish

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13 properly between the Practice of an art and the
Principles of a Science. But being a modern Sci-
ence by in nowise detracts from its Dignity, for
as Lord Bacon observes, those Sciences which are
of the most use to Mankind have required the
longest time for their formation; thus Astron-
omy Navigation and Electricity were not
reduced to first principles untill modern
times

The Earth and every compound substance
which lies hid in its Bowels or is exposed on its sur-
face, the waters and whatever is contained in
them, the air and all matters dispersed thro
it, are the objects of Chemistry, from hence appears
what an extensive Science it is. Here it will be
proper to make the difference between natural
Philosophy and Chemistry. The first treats of the gene-
ral properties of Bodies as Specific Gravity, Solidi-
ty, Elasticity &c. whilst the latter only treats of
their particular ~~properties~~ qualities. Thus with
regard to air: the Natural Philosopher explains
its transparency, elasticity weight, bulk &c.
whilst the Chemist endeavors to determine whe-
ther it is a compound or simple Body, if a com-
pound what are its constituent Parts in what man-
ner these parts are united, and lastly the Effects of
heat and mixture upon it.

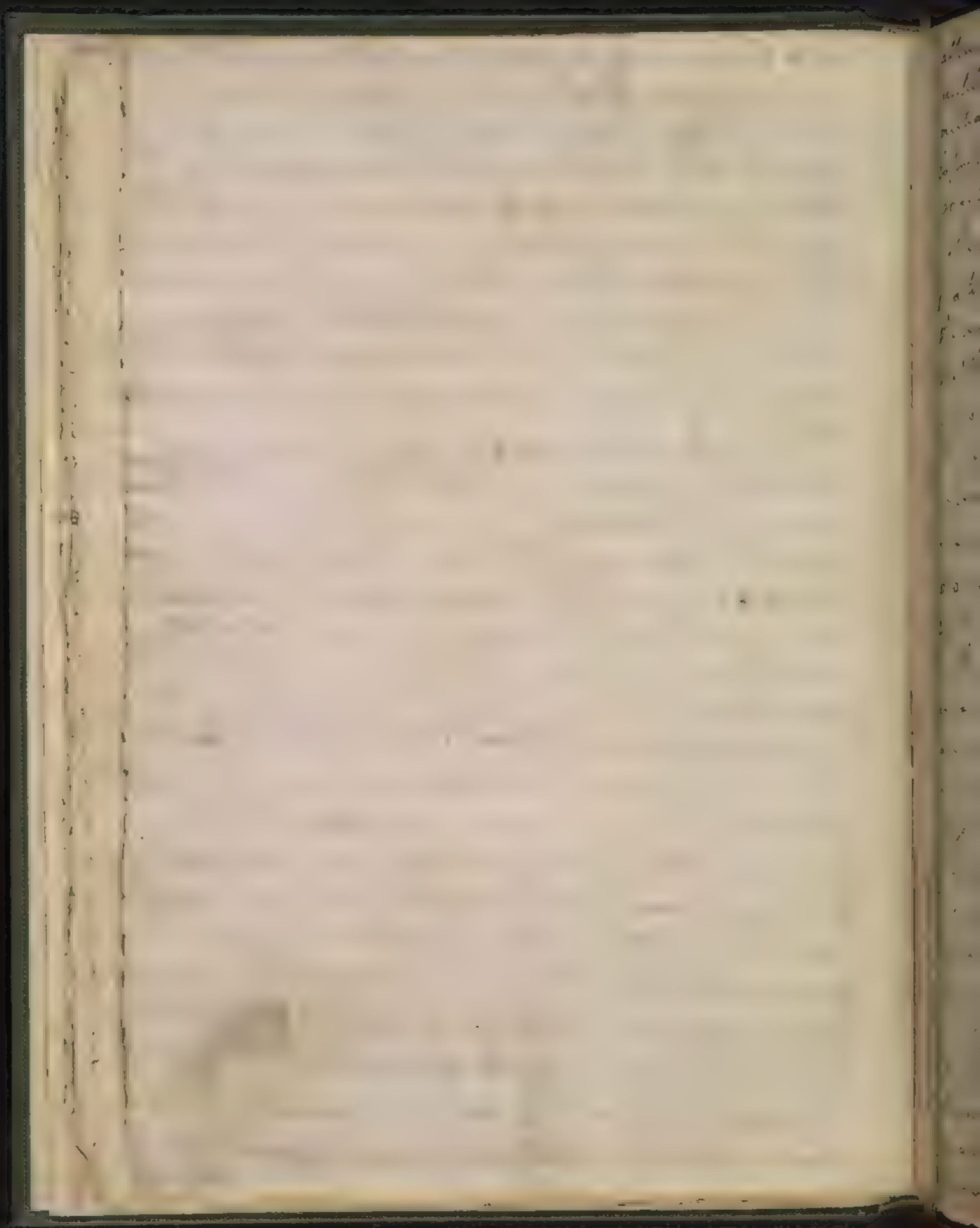
A Knowledge of Chemistry is of great use to the
Philologist it is absolutely necessary he should
be acquainted with it for without it he can get
very little insight into the nature of animal fluids
By an acquaintance with it he is enabled to

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discover, that the important process of digestion
in the Stomach is partly at least carried on by
a chemical Process. Some light is also thrown on
Digestion by the same means. It must be remem-
bered however that the laws which apply to the
action of dead matter upon dead matter can-
not be applied but with considerable restric-
tion to the action of inanimate on animate
Bodies. This was not attended to when Chemis-
try was first made use of to explain the functions
of the animal machine, hence it was frequent-
ly applied in a very unbounded and irregu-
lar manner to account for Phenomena
in the animal System which are produced
by causes totally unexplainable upon Chemical
Principles. But a more intimate knowledge of
the elements removed the false applications of
it. The Mechanical Philosophy when first in-
troduced to account for these Phenomena
was used in the same unbounded irregular
manner, and from the same cause it is at present
applied with considerable restriction and conse-
quently with more propriety. It is still un-
acquainted with the cause of animal heat &c.
which would render this cause of account it would
throw light on many appearances which occur
in the animal Economy which are now en-
tirely concealed from us. Chemistry as will
hereafter be made to appear, tends more evident





attempt of the most eminent Physicians to cure it
untill mercury was discovered to be its certain
antidote. It is by Chemistry that we are taught
to prepare these and other mineral substances
so as to be fitted to enter the human body. It is
by the assistance of this science that we are ena-
bled to get salutary medicines from substances
the most poisonous. Some persons imagine
that the vegetable Kingdom contained medic-
ines fully capable of removing all diseases &
therefore that there is no necessity for having
recourse to the mineral Kingdom. But I
would beg leave to ask those gentlemen
did not the same almighty hand, which plan-
ted the Sycfy and endued the peruvian Bark
with its wonderful qualities make a medi-
cine virtuous to those instances which
are common in the Bowels of the Earth. I do
not mean to infer that Galenicall medicines
possess no healing properties on the contrary
I think they are endowed with ~~considerable~~
valuable virtues, but Chemistry is still
indispensable hand as scarcely any vegetable can
be prepared for medicinal use without it.

This science also explains the doctrines of
the and holds hence it is further useful to the
Physician as by its means he can ascertain the
qualities of the climate in which he lives. The
knowledge of these qualities is absolutely necessary



necessary to the Physician who is engaged in Practice
as many diseases take their origin from a sudden
Change in their qualities & all diseases are much
affected according to the state of the climate in
which they happen. From a knowledge of these & by
a knowledge of Chemistry Physicians are sometimes
enabled to discover the causes of diseases which
otherwise would have remained from them.
Thus Dr Baker by being versed in this Science has
justly truly ascertained the cause of the disease
in Bolivia. His cause he justly says is by the
impregnated with lead used in that country.
This liquor becomes thus impregnated by running
from the Press thro Leadern Pipes and during
its passage by its acidity dissolving part of
the metal some years ago the people of Chusma
were much afflicted for several succeeding
Autumns with a species of Colic resembling
that of Tronshire. It was discovered by a
German that this disease was occasioned by
the use of the water impregnated with lead.
He conjectured that the water received this im-
pregnation from the leaves of the trees which
grow before almost every house, during the
Autumn falling on the Roofs of the houses
all which were at that time made of lead.
These leaves by laying there would ferment



and thus form a vein or which would corrode
the lead and be worked down by the succeeding
veins which water was used in that by the inhabi-
tants. His conjecture has been fully verified
for some that time the leaden roofs have been
removed and Tiles made use of, and the bell
is now very seldom heard of.

Chemistry is of the greatest service to the Metals
urgists I should here extend the meaning of Metall-
urgy farther than is commonly done. I would
comprehend under it every operation which
is performed on metals by any artist whatever.
The Alchemists have to us been the rivals of
the barons to discover a substance capable of
converting the base metals into gold. They
failed however in all their attempts. They never
even attempted it at all if they had
been considered that gold is only valuable
on account of its scarcity; and therefore
if they had succeeded in producing this change
they would have defeated the purpose for
which they underwent such great labor; i.e.
their employment would have been very
little indeed they however succeeded. *provided*
Metallurgy.

If the limits of this lecture would permit
I might have descanted upon the usefulness



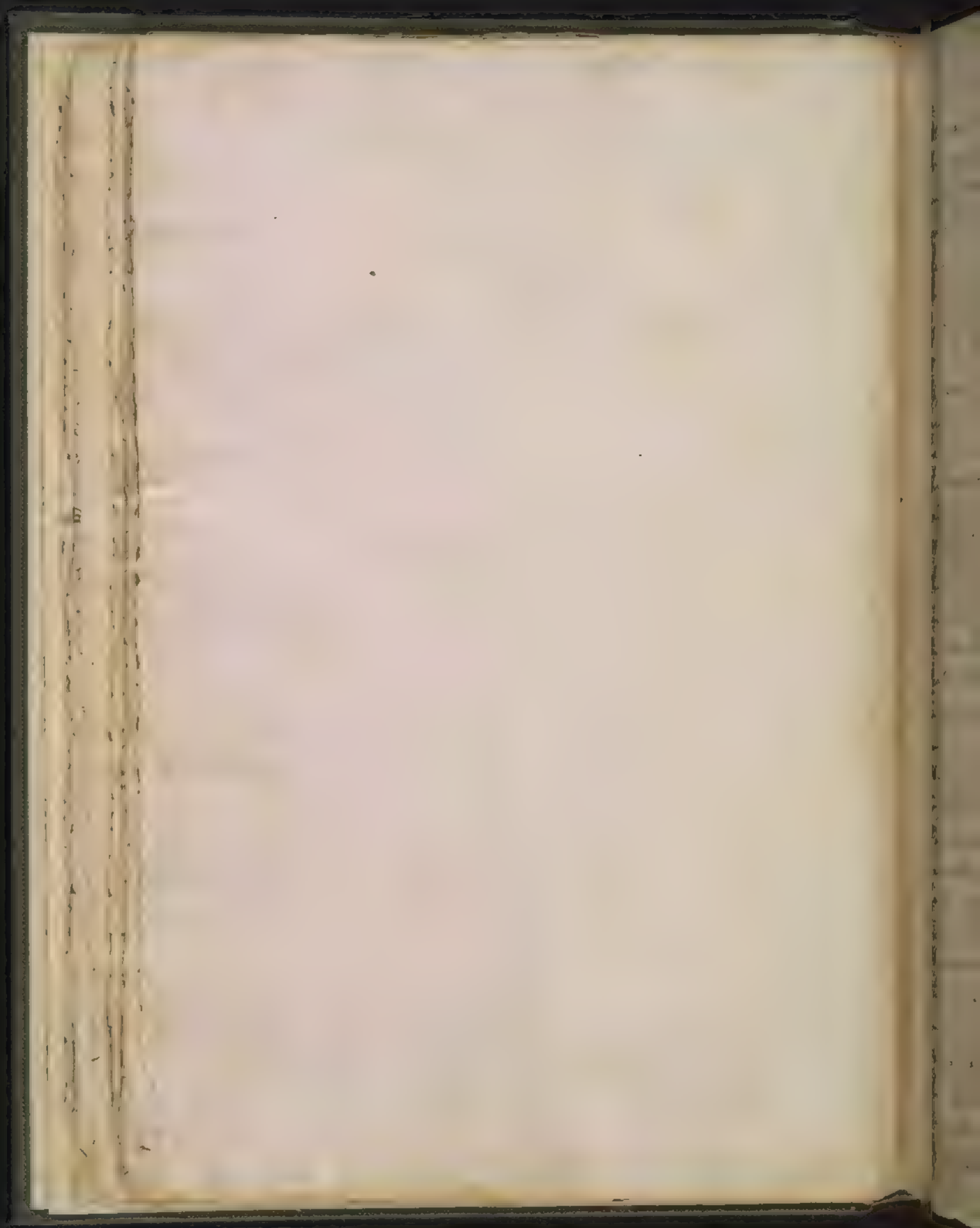
chemistry to the farmer, the baker, the dyer, the
book binder, the brewer, the cooper, the painter
and the worker in clay, from the maker of
paste to the generator of the most common
earthen ware

It is also serviceable to the natural Philosopher
from a knowledge of it our illustrious Country-
man Dr Franklin has been enabled to
discover that thunder and lightning are
not owing to the nitrous acid in the air but are
entirely ~~owing to~~ caused by the action of Electricity

Now what has been said is so important that
a knowledge of Chemistry should not be confined
to the Physician, but that it is serviceable to
every artist, and that it merits the attention

of every man who wishes to complete a liberal
education. I cannot remain from congratulating
you when you consider that you are blessed in
a vast field for the exercise of genius abounding
in minerals in the substances which are the objects
of commerce. Precious stones of all kinds are found
in the banks of the Ohio, clay suitable to the making
of porcelain and for enamel in the Delaware and Potomac
basins and copper in Pennsylvania and iron, coal
in Pennsylvania and even native mercury in
New Jersey.

When we consider this would it be presumptuous
in some one of us to expect to have his name
united with that of a Gulliver or a Black?



In our history long - we are pointed out the
Use and Importance of Chemistry at present we shall
proceed to say something of its origin. This Science was rooted
in the East in Egypt and from thence travelled into Greece
and Rome. Hence we read mixed Gold with water and from
hence we conclude we had some knowledge of Chemistry
in Greece. Chemistry made some progress but as it was entirely
by confined to priests it made less advancement than it
now in the East. We have done in Rome it first made its
appearance as a regular Science at this time the Athenians
made their appearance and aimed at conquering the
world. We are to find which coming to the knowledge of
the Emperor Socrates he published an Edict which put a
stop to their attempts. Learning if they succeeded by a universal
teaching they might be enabled to rebel against him. About
the 10th century Chemistry revived in Arabia and Avicenna
wrote upon it. From Arabia Chemistry with
the other Sciences travelled Westward and first had its
seat in Spain from thence it made its way to France
in Germany. This Country is peculiarly adapted for its im-
provement as it abounds with Mines. Boerhaave gives a long
History of Persons who cultivated the Science in this Coun-
try but I am sure I have to be the first worthy of our notice
Paracelsus appears to be a very singular and extraordinary
Character and distinguished above all Chemists. Before him
men viewed it as a part of the Scholastic Physics. Paracelsus
viewed it as a Medicine and raised in question its doctrine
and its name. He first thought bold in this overture
and of his name soon after the death of Paracelsus Chemis-
try made its appearance in England and particularly che-
mised by Lord Bacon who was the first who wrote upon
this Science in that Country. His works are ingenious and
highly valued. soon after him appeared the celebrated
Dr. Boyle who did more service to Chemistry than all the
rest.



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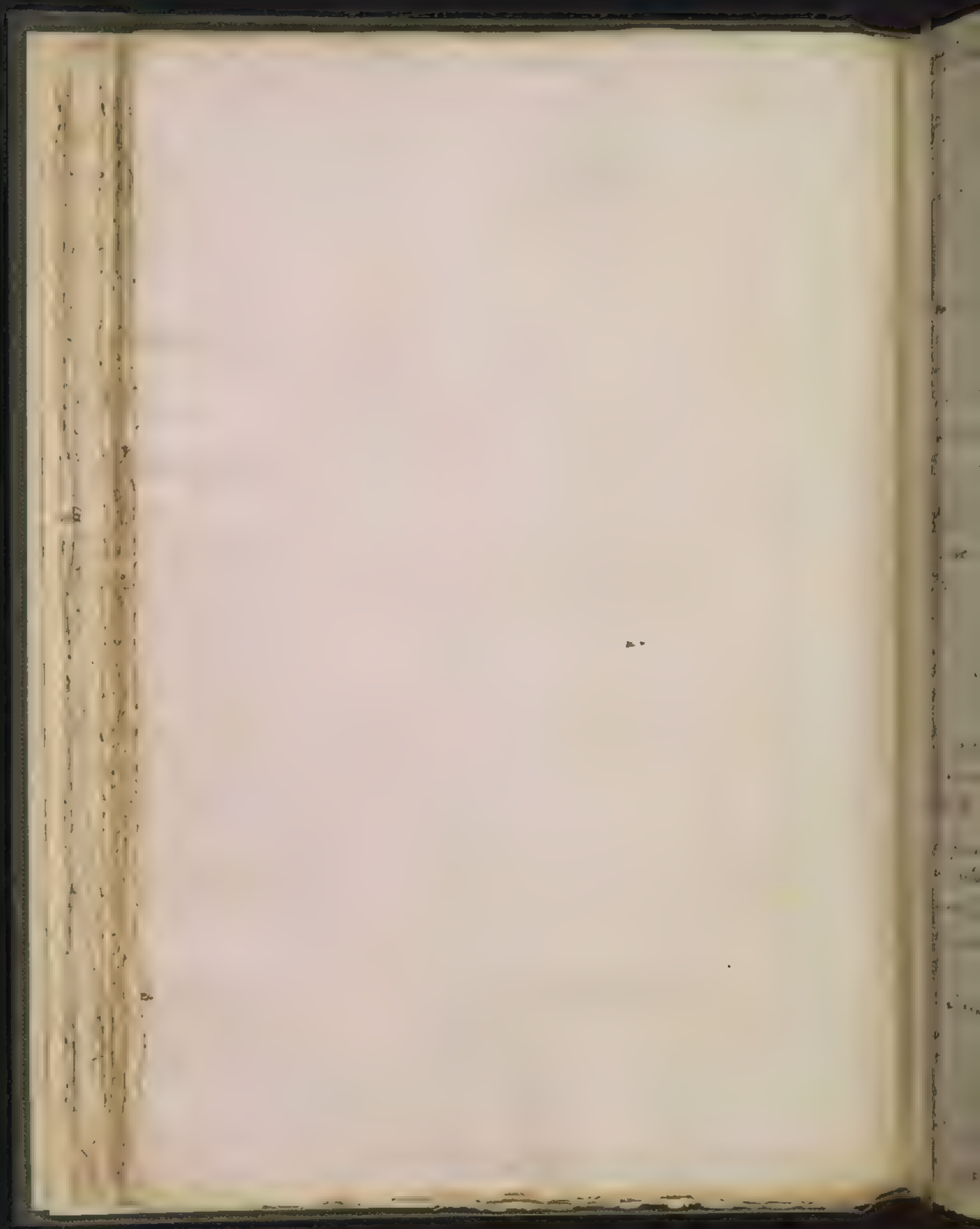


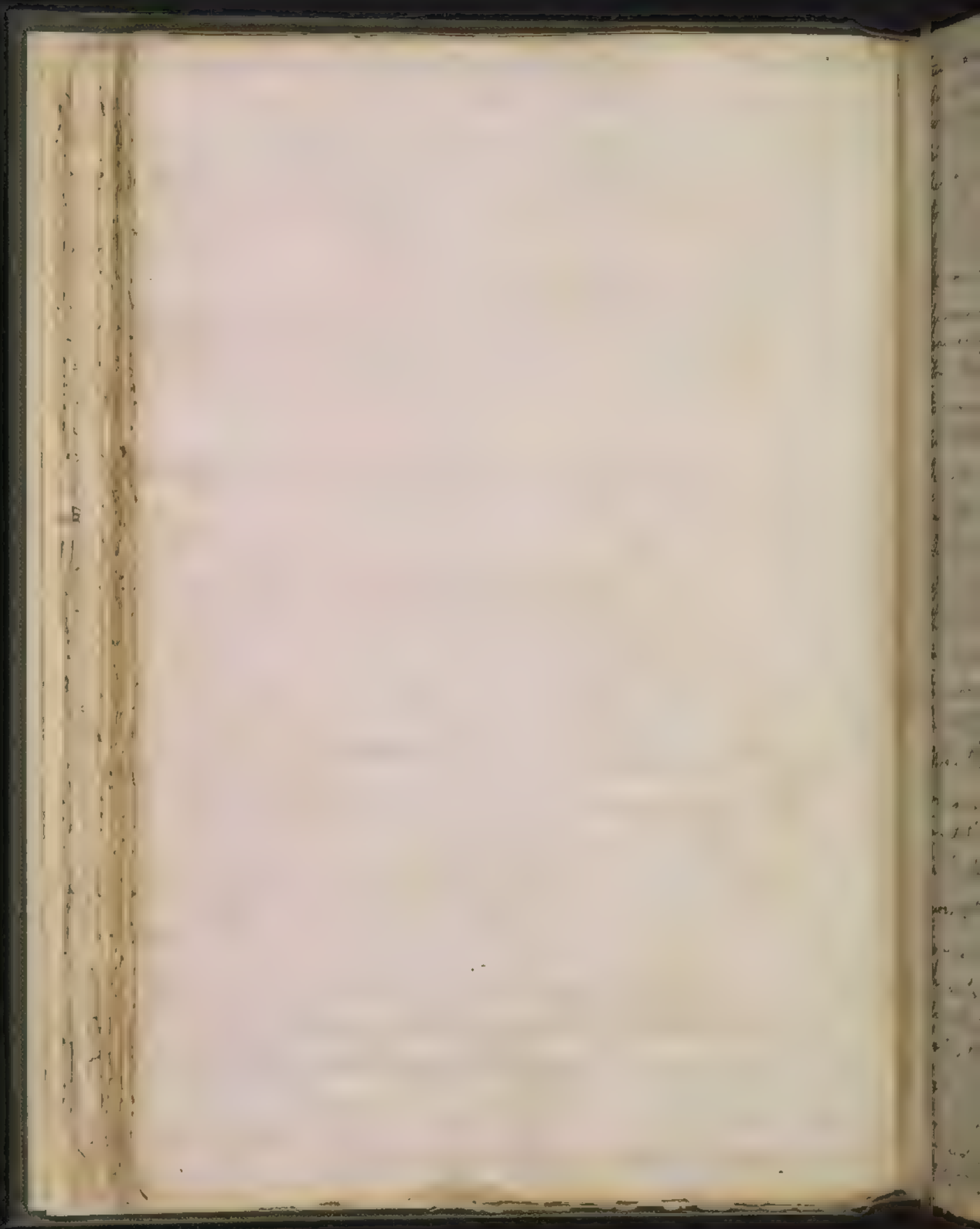


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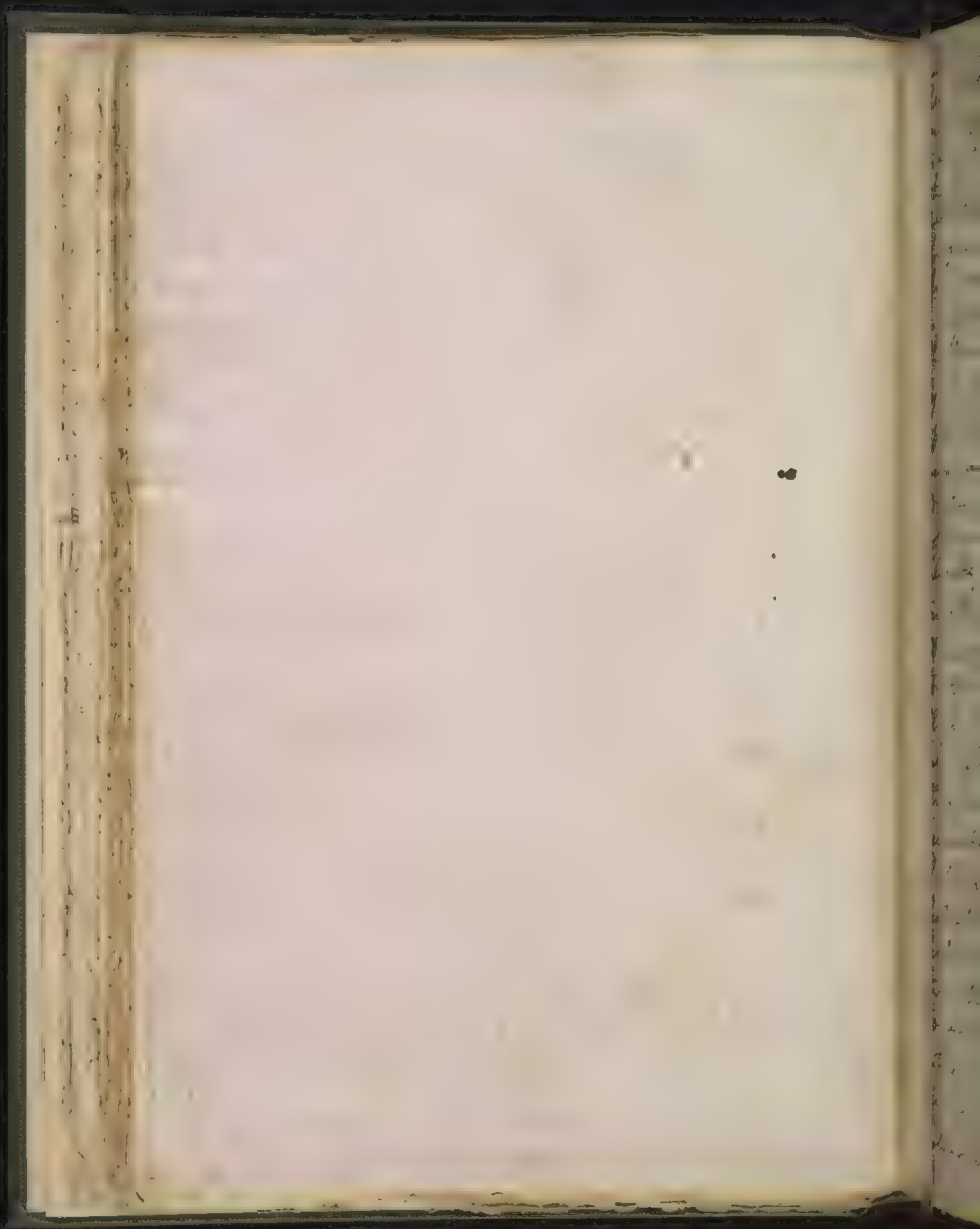
It has been observed that the same small history
is the same in the beginning and end of the same
is the same in the beginning and end of the same

The first of these is the fact that the
 human mind is not a blank slate, but is
 filled with ideas and impressions from
 the past. These ideas and impressions
 are the result of the mind's activity
 in the past, and they are the basis
 of all our knowledge and action. The
 mind is not a passive receiver of
 information, but an active participant
 in the process of knowledge. It is
 through the mind's activity that we
 are able to understand the world
 around us, and to act upon it. The
 mind is the source of all our
 knowledge and action, and it is
 through the mind that we are able
 to create a better world for
 ourselves.

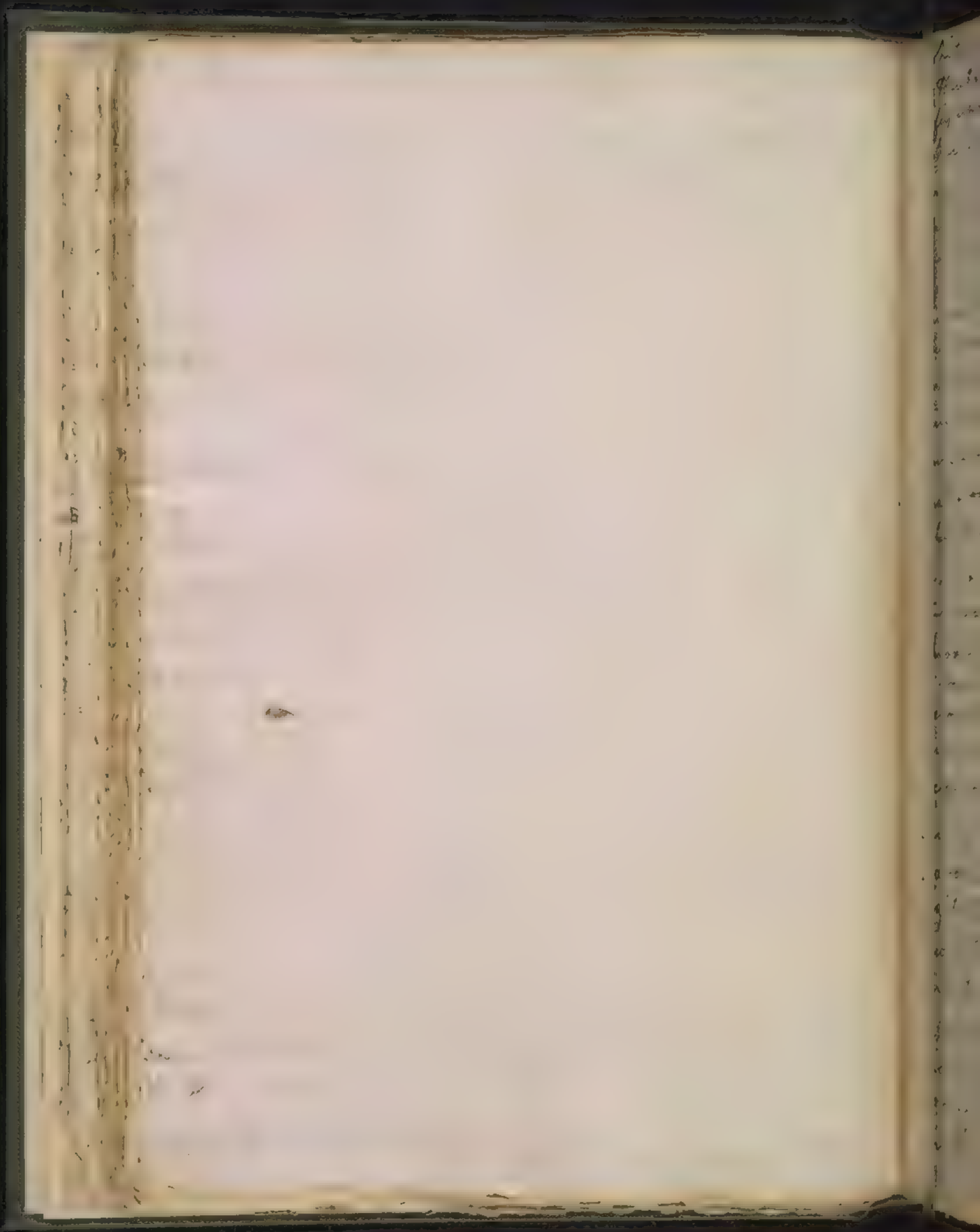




in water than in air. Indeed if there was any
conductivity of air it is air, as a conductor very
commonly water by the same particles in the
air. If we have a not an analogy between
heat and Electricity not heat is a vibration undu-
lation of electricity and they transmit heat in the same
manner since the fire from the same wooden water in
the water in the utility of the friction of the
germans in riching water. The bed which
saves a great expense and weight of bed clothes.
From the machines which are now in use one oft
to imagine they are now in themselves but this
is not the case as they are in fact bodies of air. There
is a preserved from freezing in summer by
nothing it is in fact a warm wooden cloth and
the houses are generally lined with some warm
substance which is not only but is a con-
ductor or do not conduct bit of heat. Hence
we see the snow is a good conductor so much
to render the soil fertile for by covering the
ground it is ever it renders it ^{moist} and healthy.
Upon this account it appears to be a wire proof
vision of nature in cold countries preserving
vegetation during the winter. Hence
in Persia and Siberia upon an early
snow of the snow we frequently find the ground
covered with verdure. Hence we call
this to our assistance it would appear that
in Canada vegetation goes on much
faster than in Pennsylvania. For the snow
holding in the winter before the snow has
prevented the ground being affected by the
increasing frost. Hence we have very



and the north wind the snow fall which does not
near like the heavy and frequent snow in the south
to go by the frost into the south. The south wind
is frequently thick but it is not deep and on
the face of the mountains which is not
most frequent in the late cold winter or toward
frozen six feet thick a depth of snow is never
seen in the mountains. Hence or soon on the snow
melted away in the south is not so deep as in the
the the snow in the north begins to plough immediately
by which he can do it and the frost is out
of the ground. The country of nature is
very beautiful and deserves our attention.
Nature seems as provident of the animals as
of the earth in cold countries. She forms the
clothes with a soft warm substance or fur
and the latter with a downy blanket of wool.
When we speak of warm bodies having had cold
bodies of the same mean warm wind bodies and not
fluids. The cold or the heat has a considerable
influence in the communication of heat.
Thus water is a bad conductor of heat. It has
been supposed that the movement of the air
of old people grows with it is to defend the
heat of the water for us lies by preventing the
heat from being carried off. We have observed
the instance of the boat which nations to the
of animal in cold countries. Those which
in the north are covered with hair and
receive a covering of wool when taken to the
older regions. Thus a darker color becomes
white





of the sea by heat being melted by the
heat communicated from the air.

as the sea is so much warmer than the air
for some miles off its shore.

It is in the winter that the heat of the sea is
most felt, & the heat of the sun is not so much
employed for heating the bodies and is called Baromet.

Mercury or water is the most common & the most
substantial in the heat of water which remains a great

or degree of heat in the air & in the water
But I do not think it would answer or is too dense
and heavy and in large vessels from the great quan-

tity required and from the evaporation which
it is liable to it would be very expensive. I have
a suspicion of that large bodies of water, however,

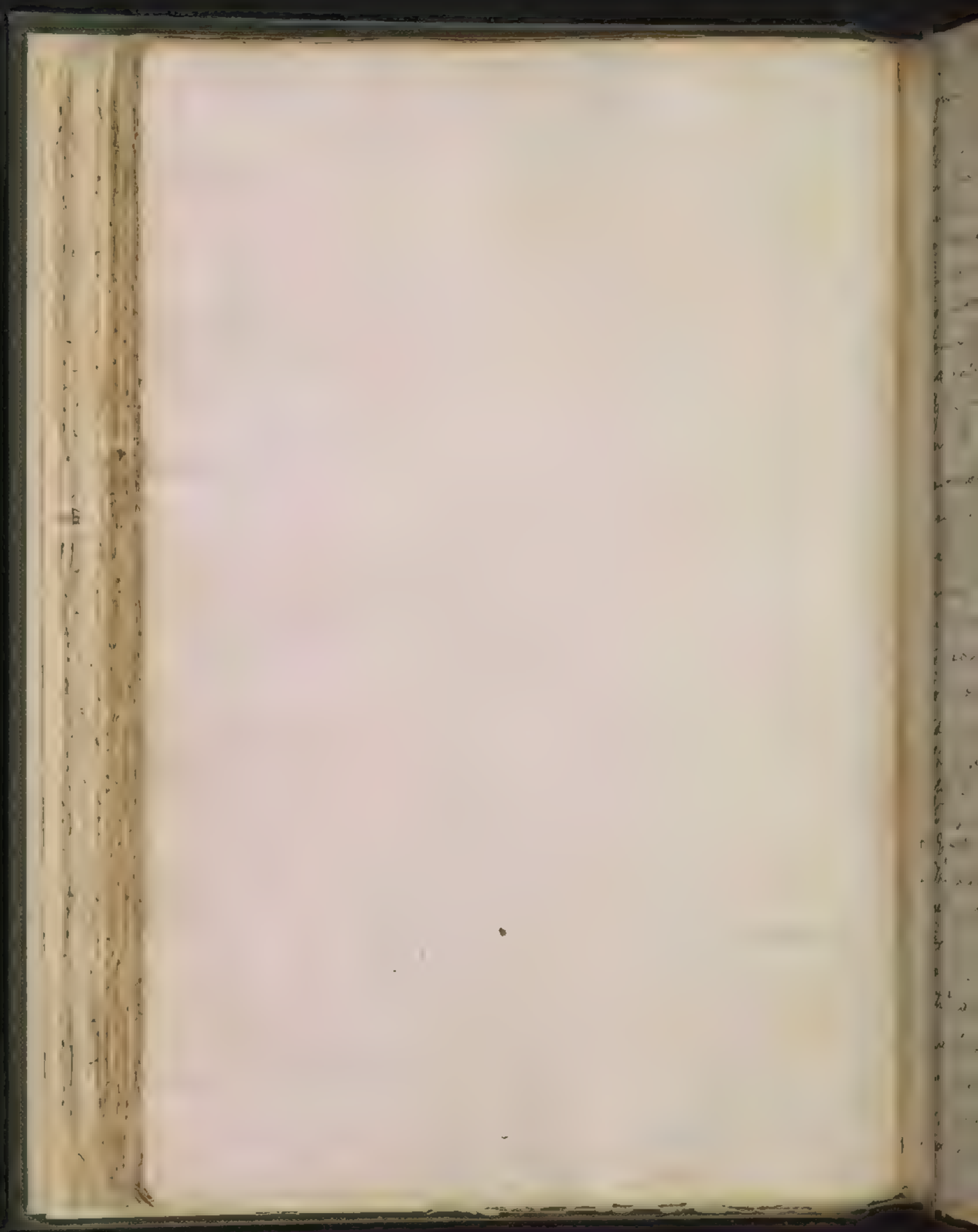
nearly the same degree of heat in every part of the
surface. I have known it in circumstances some of our
of lakes are never frozen in the coldest winters or

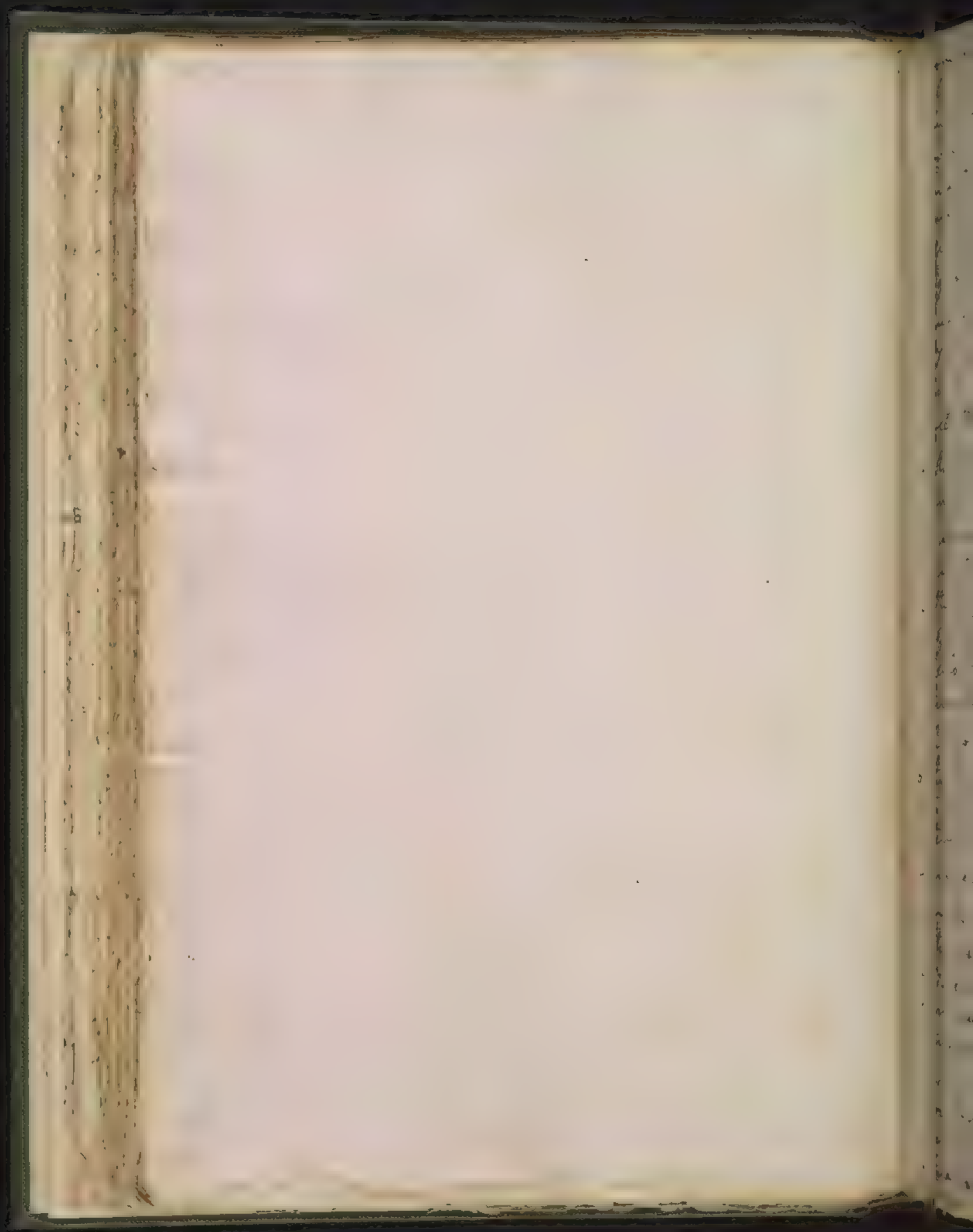
the warmer water from the low or ins and depths
the surface of the cold water on the surface when
being condensed sinks. Hence land situated near

large collections of water is never so cold in winter
as the land in the same
latitude which is more remote. Thus the cold in

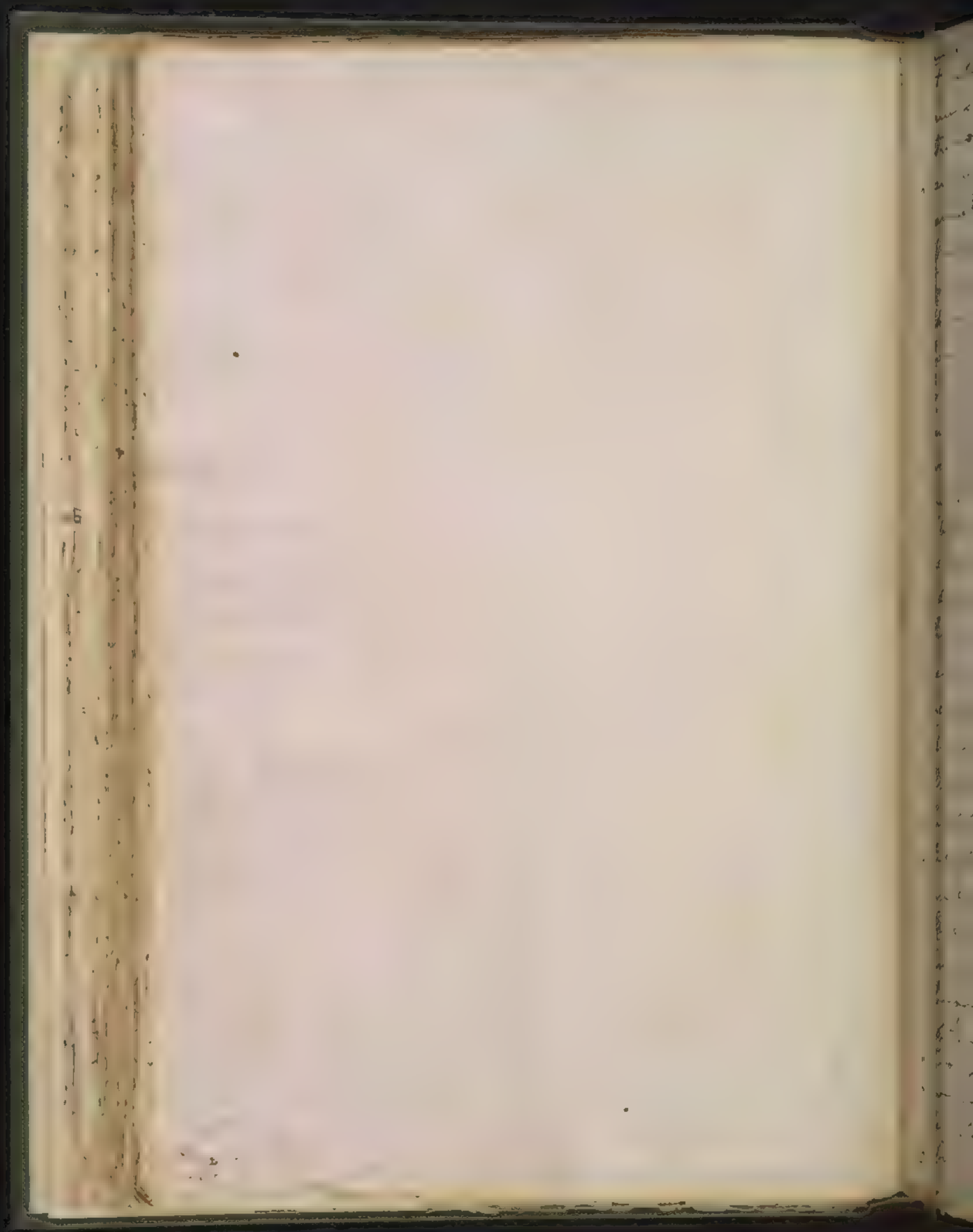
great Britain which is situated between the 50th and
60th degree of N. latitude is scarcely ever so great as in
New Sweden - as the former is entirely surround-
ed with water.

6th Question in the history of the sea is not

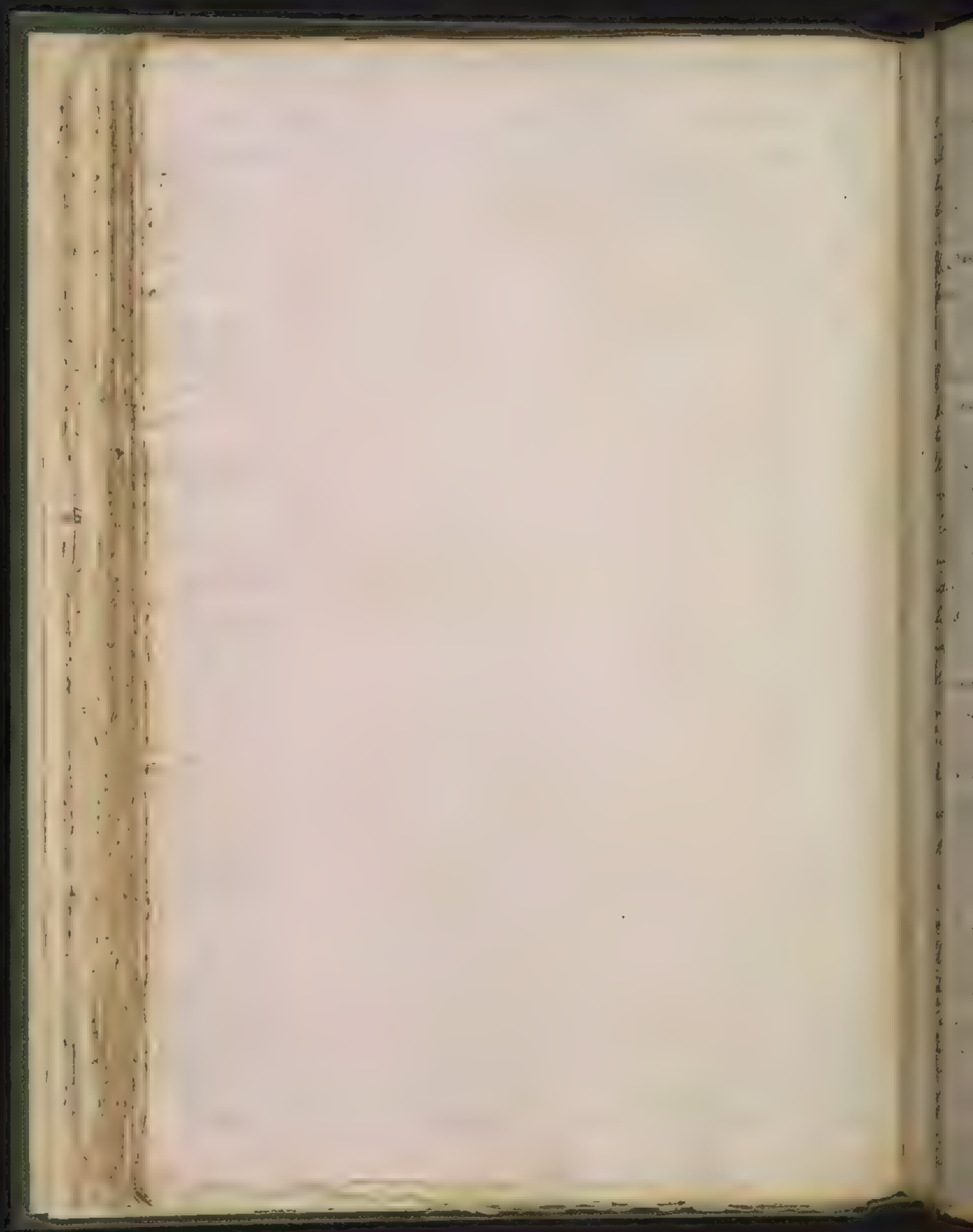




one or within a mile but one seldom to write to
 in the year 1779 the fruit was generally destroyed
 in this and the neighbouring states, except when growing
 near some elevated situation in the mountains as was
 in a sort of mountain but this exception was more
 remarkable on the Jersey than on the Pennsylvania side
 and in some places the wheat being carried
 in a great quantity by the way by the N. E. wind
 which generally prevailed
 3^d The difference in the quantity of soil upon
 the two sides of the fall thus a some rocks soil is
 lighter than a sandy one
 4th The contiguity of the mountain which screens
 the land from the winds in winter and cool the air
 in summer from the sun and so drops on the
 mountains
 5th The winds blowing from the different quarters
 but the greatest is the N. E. wind in this country
 blowing over the frozen lakes and an im-
 mense tract of continent covered with snow
 the snow is exceedingly cold.
 6th The presence of clouds obstructing the rays
 of the sun. There is another reason why the lands
 are warmer, we have an cooler in summer than
 continents from the flying clouds arising
 from the evaporation of the adjoining ocean
 continually hovering over them
 7th The situation and state of business in adjacent
 countries the climate of Italy has been much
 changed since the late war. The climate of
 the winter is often unusually hot but the summer
 is a custom that prevails amongst the
 Romans is now the custom to turn into the sea & after



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The next should be way or a river, a quantity and all
that might be taken from under the trees there and vegetable
matter is heavy on ground as was reported by local and
on "sawmills" at all times, many are now used
one nation, which affects most

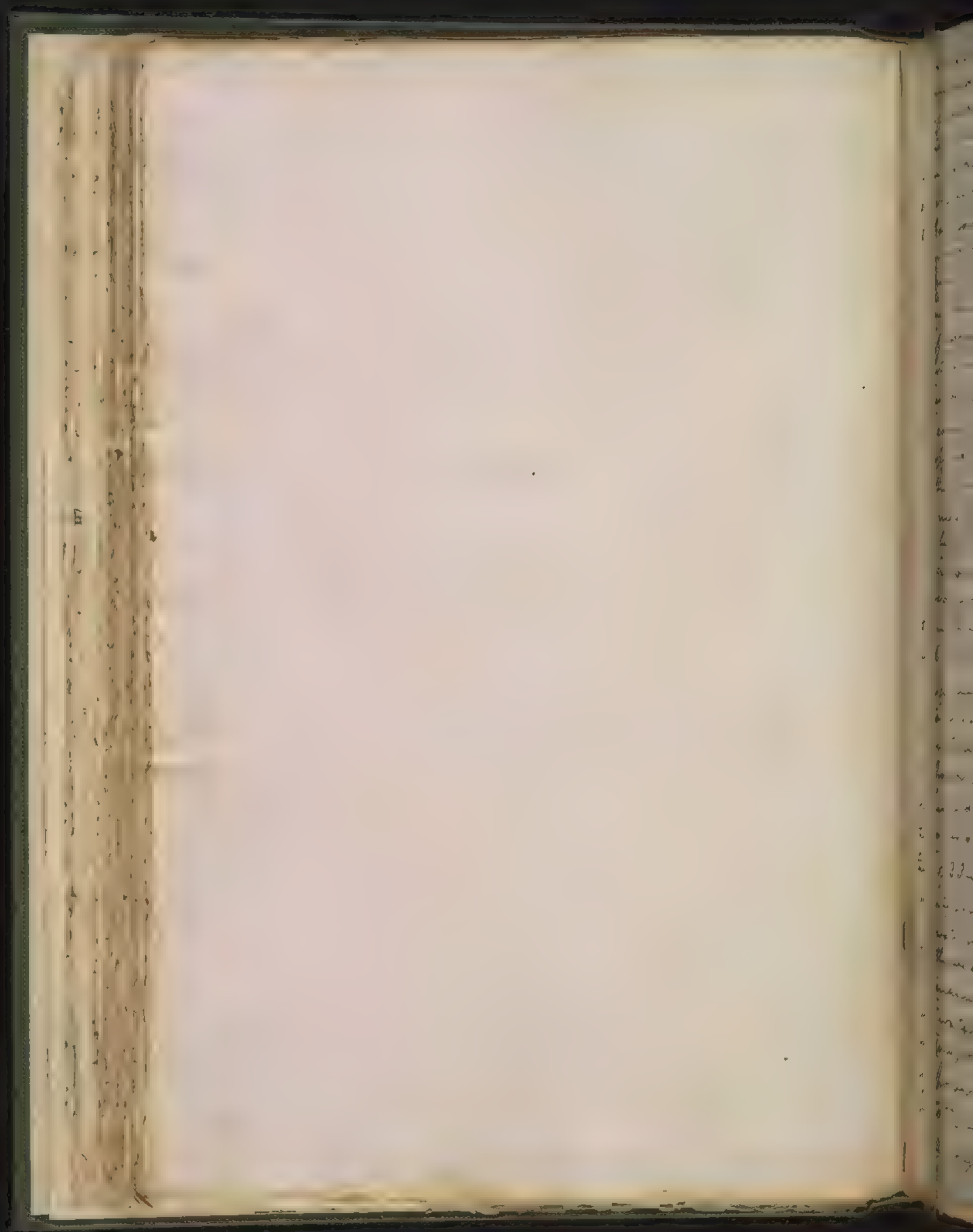
in explanation:

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in weather but after a few days only insects will
 'proceed with the greatest care. The variation in clock
 and watches depends upon the materials which they

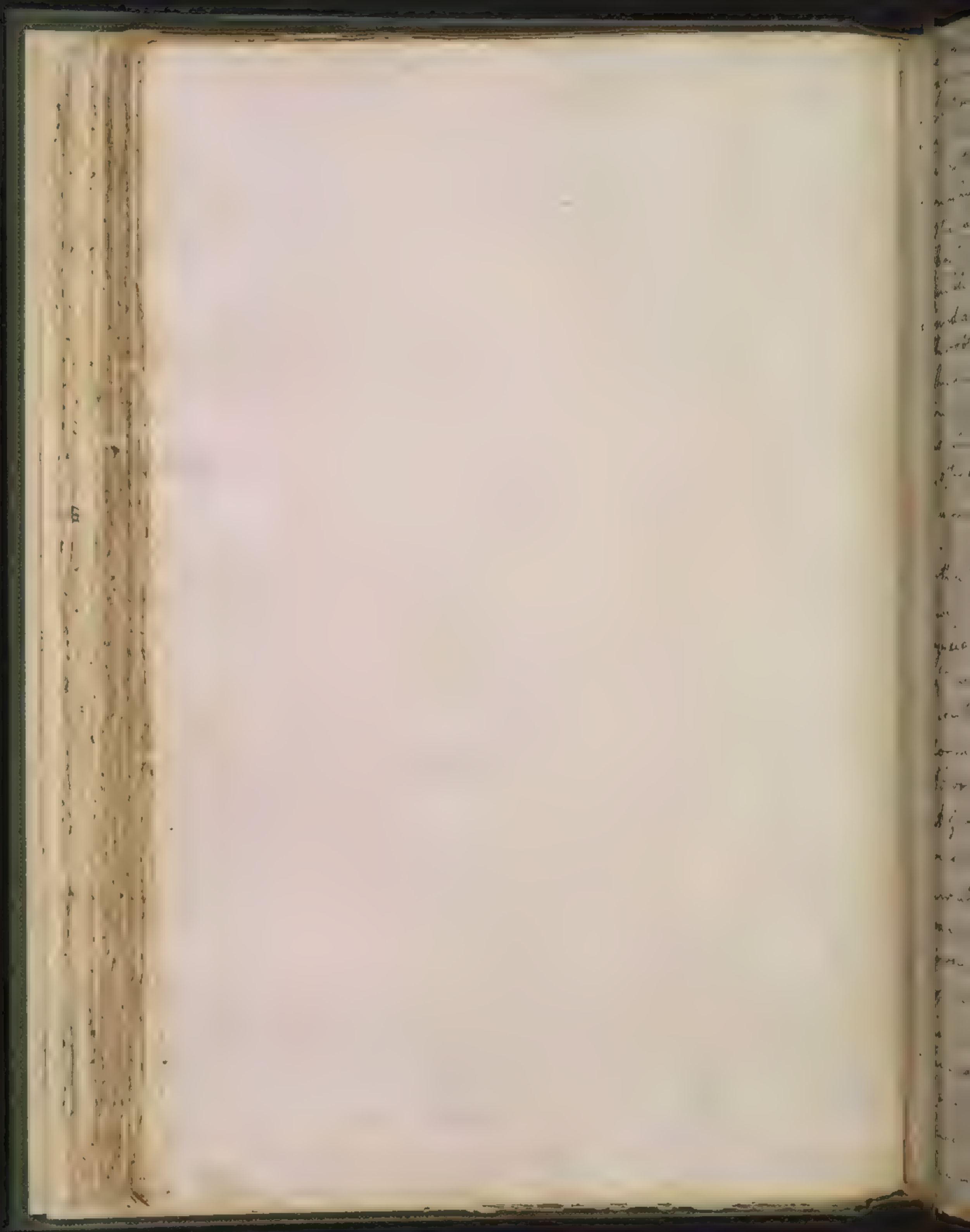
mine into a fine mass and in warm water the soil
will mix so easily and fine red color, and a similar
cold water solution, it is more difficult to mix.

1. The first part of the paper is devoted to a discussion of the general principles of the theory of the structure of the atom.



Let us now consider the expansion of bodies when immersed in to show it is not as much as is related in a number of places much larger than before. In general bodies we differently expanded when heated. That this is upon we know not in general we and the demand for is rather is pambus expanded heat. This however is not always the case for some metals expand more than glass in water when immersed in it. measuring in different degrees of expansion in different bodies is a case of expansion by this is the case. The demand is not constructed a table of the different degrees of expansion in different bodies. This may be useful to artists in making nice machines. Some artists have availed themselves of this experiment. There is a machine large brewing tubs made of the metal lead the iron hoops not before by me of lead and in this condition put them on the vessels. But this is a very dangerous and dangerous thing to see more strongly than from any mechanical force that can be applied. In the same way is practised in making the iron hoops of a barrel commonly so called the iron hoops. Then one made of a number of small iron hoops connected together with plaster of Paris. The next construction on growing cold in the water more compact than they would otherwise be made.

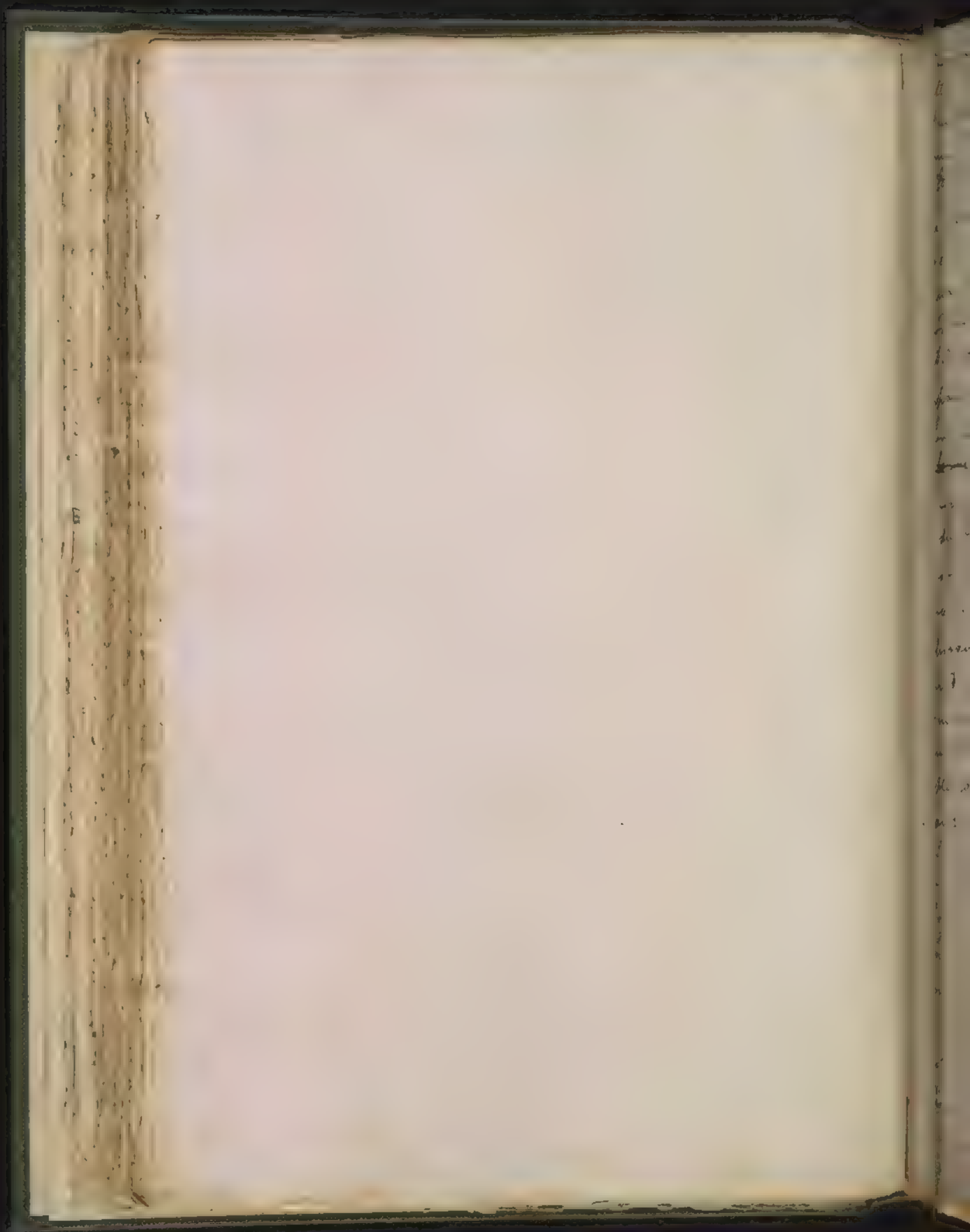
Water is almost the only body in nature which is an exception to our general Rule and sends the contraction the power of Cold. This fluid is rather increased than diminished in bulk when converted into ice. In order to be assured of this fact Mr. Boyle put some water in a wooden tube of 3 inches in diameter and on it put a weight of seventy pounds and then exposed it to an intense cold. The water was no sooner frozen than it was so enlarged that the weight placed above was raised considerable. In the manner Mr. Hugenot burst a cannon by filling it with water and then exposed to a degree of cold below the freezing point inducing this mighty effect by the expansive power of Cold on the water. His calculation, however, that the weight overcome is equal to 27700 pounds and he says that the water increases 10 in bulk.



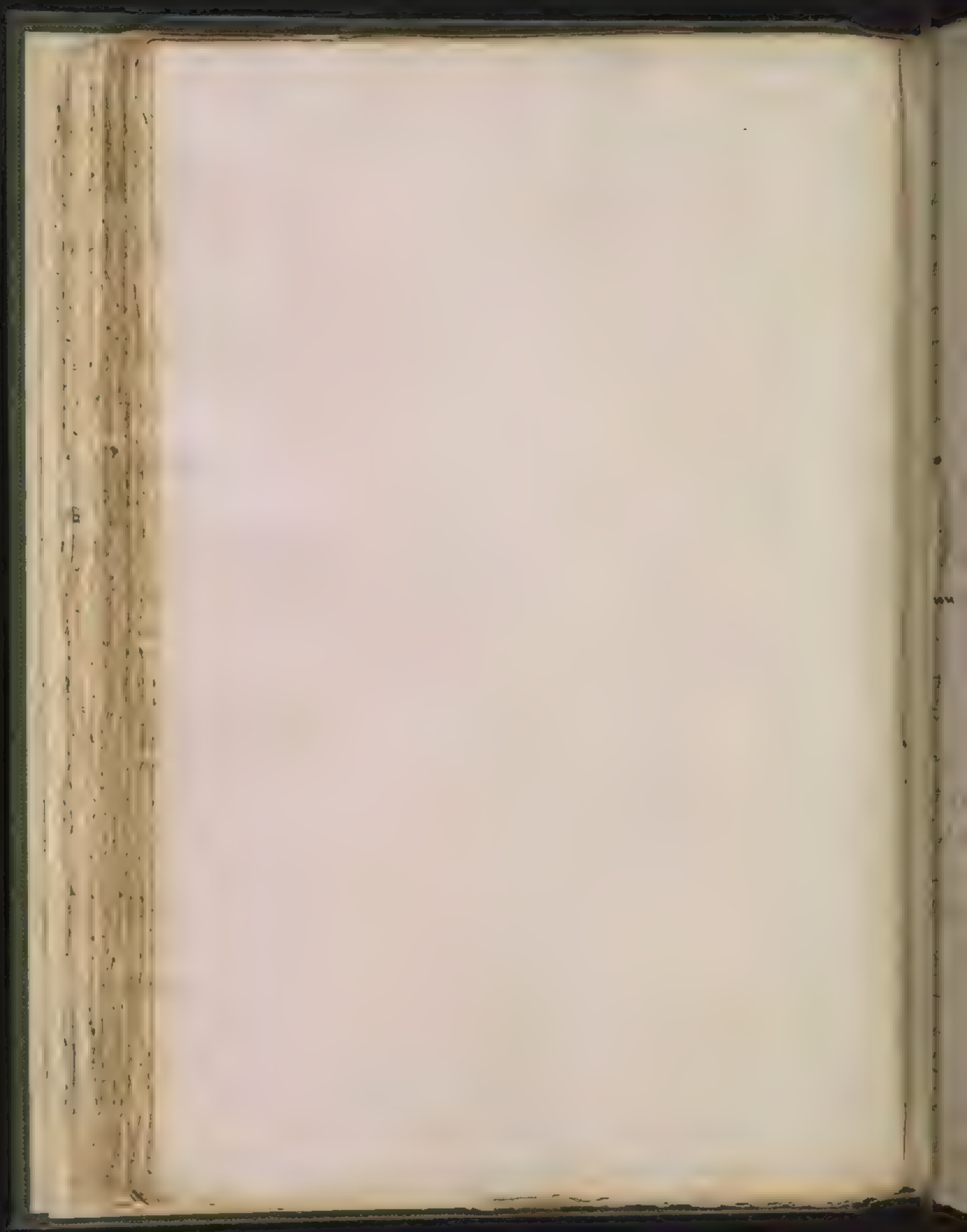
The Florentine Academicians put some water into a sphere
of half an inch in Diameter and exposed it to a freezing mix-
ture. At first the sphere was so strong that the cold had no effect
upon it, but when having burst out of it was burst with vio-
lence by the expansive power of the Ice. From whence
learn why gentle rains succeeded by frost so greatly jer-
king the Earth; for the moisture immediately turns into
the Earth and being there frozen by its expansive power
unmolds the earth into small pieces, this mellowes the
ground and makes it to be more easily penetrated
by the roots of the plants and the external air the cold
which is a little from the vegetation. For this we
learn by experience to be true. Soon after a sudden
thaw; many unroofed houses moulder away gradu-
ally after a long and cold winter and also conduits
Pipes are so frequently burst after a cold winter in
this manner their running too near the surface of the
Earth so that the frost does access to them and freezes
the water contained in them. The Cordeliers have been
much led to account for this encrease of bulk. Some-
times thinks this expansion in ice to be owing to the
air contained in it which he says may be seen in
the form of bubbles in the most solid lump of Ice.
But I would object to this 1st That it is the uniform
effect of cold to condense air, and not expand it. But
owing his consideration, after depriving water of
its air upon exhaling it to cold. When some kind
Mairan found that it was still frozen and when in some
arrangement of Bubbles. 3rd Hales has put the matter out
of doubt for having put a piece of Ice under water
pierced with holes into these bubbles which appeared
in the Ice and found that no air moved out quicker or
with any force when warm - would move in the
Ice had there been any, would immediately in the
water in which Hales very supposes it to be. Mairan

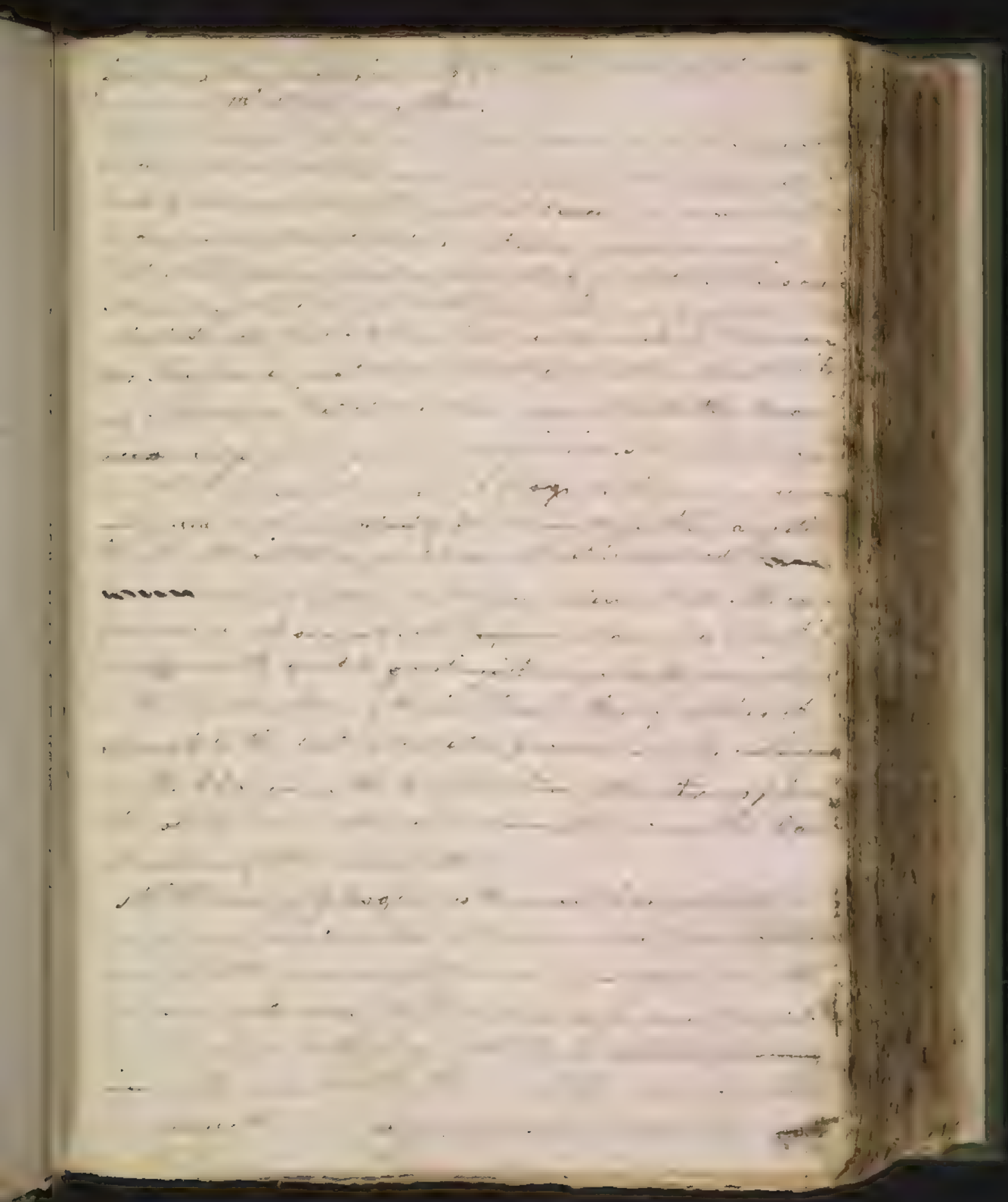


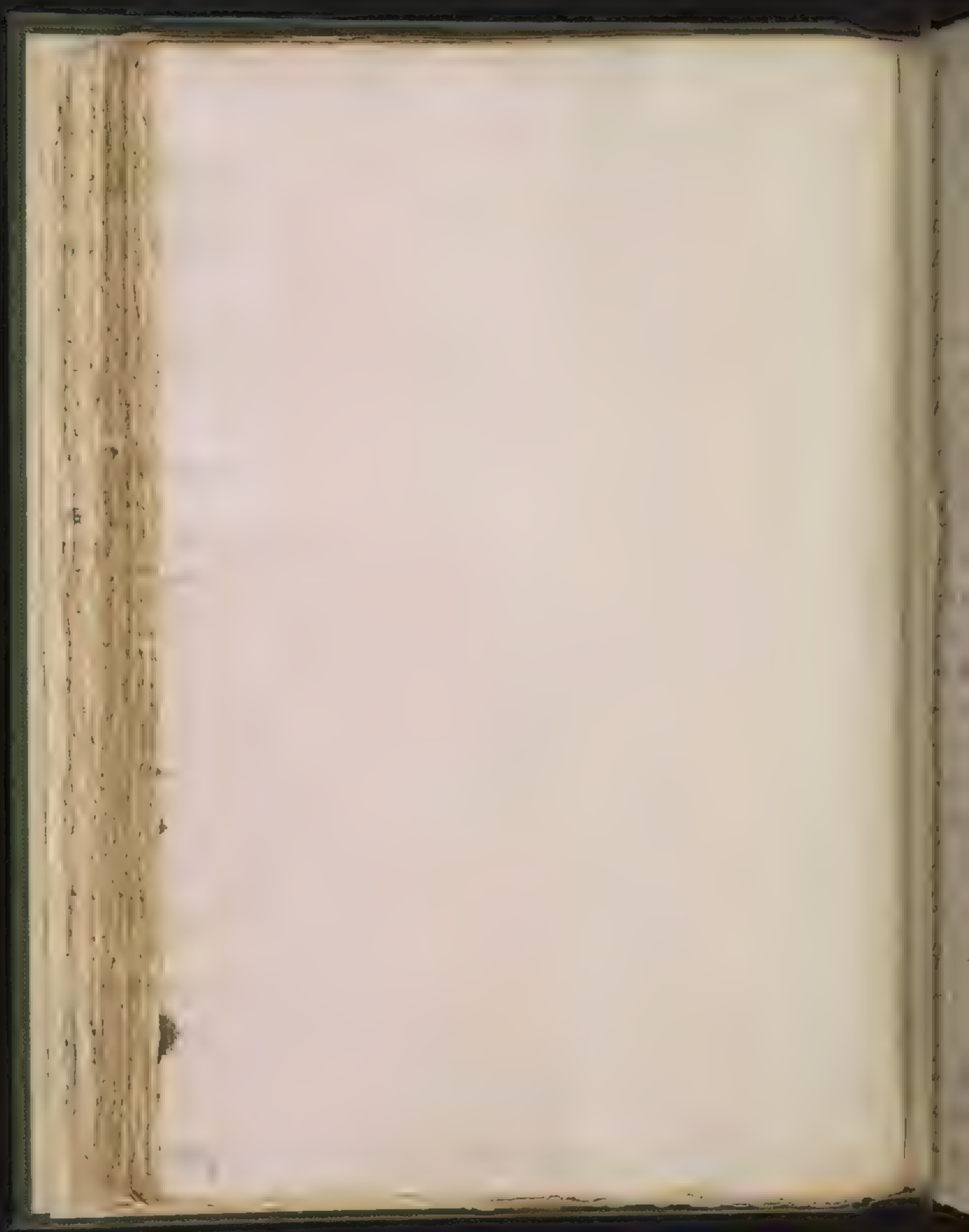
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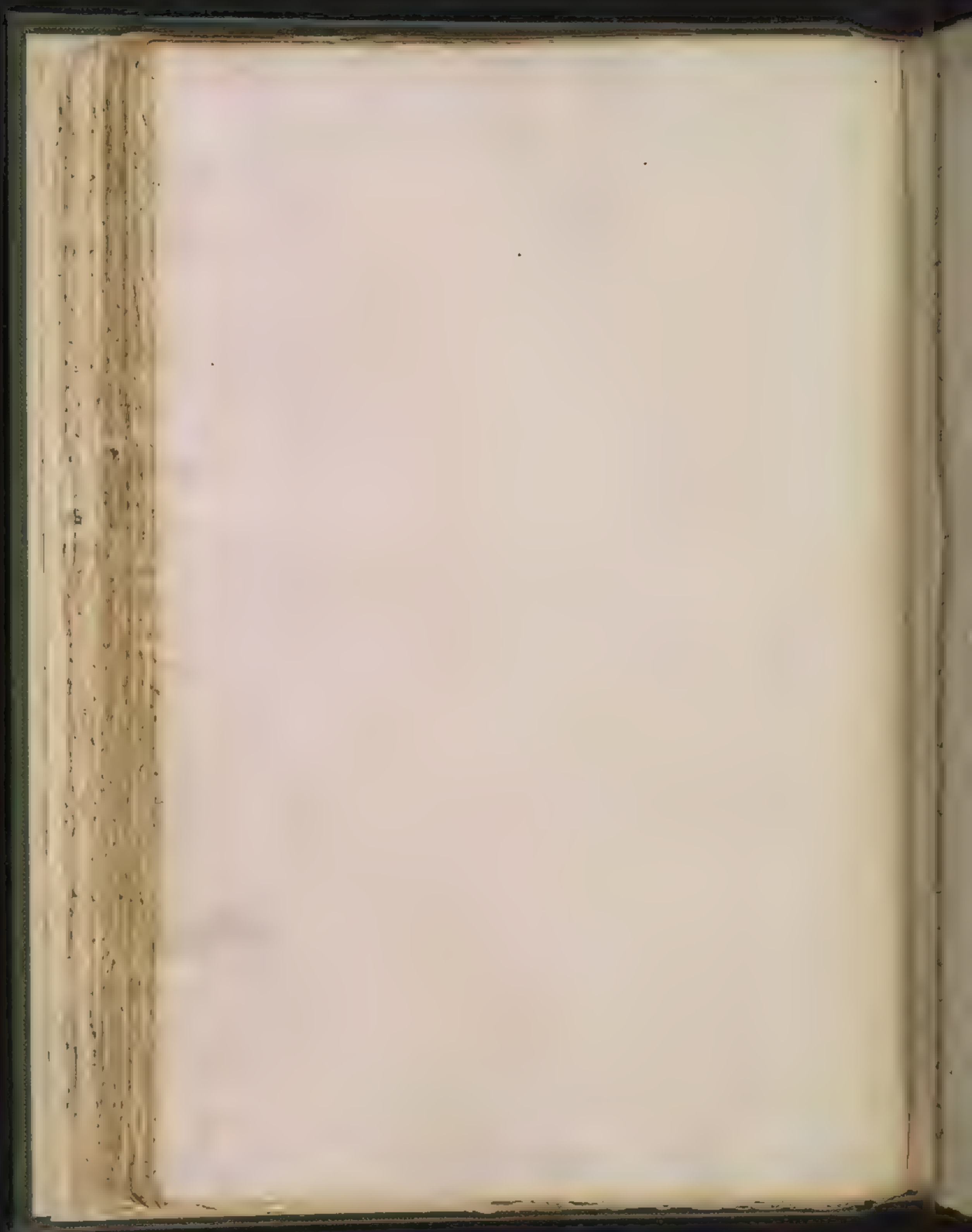
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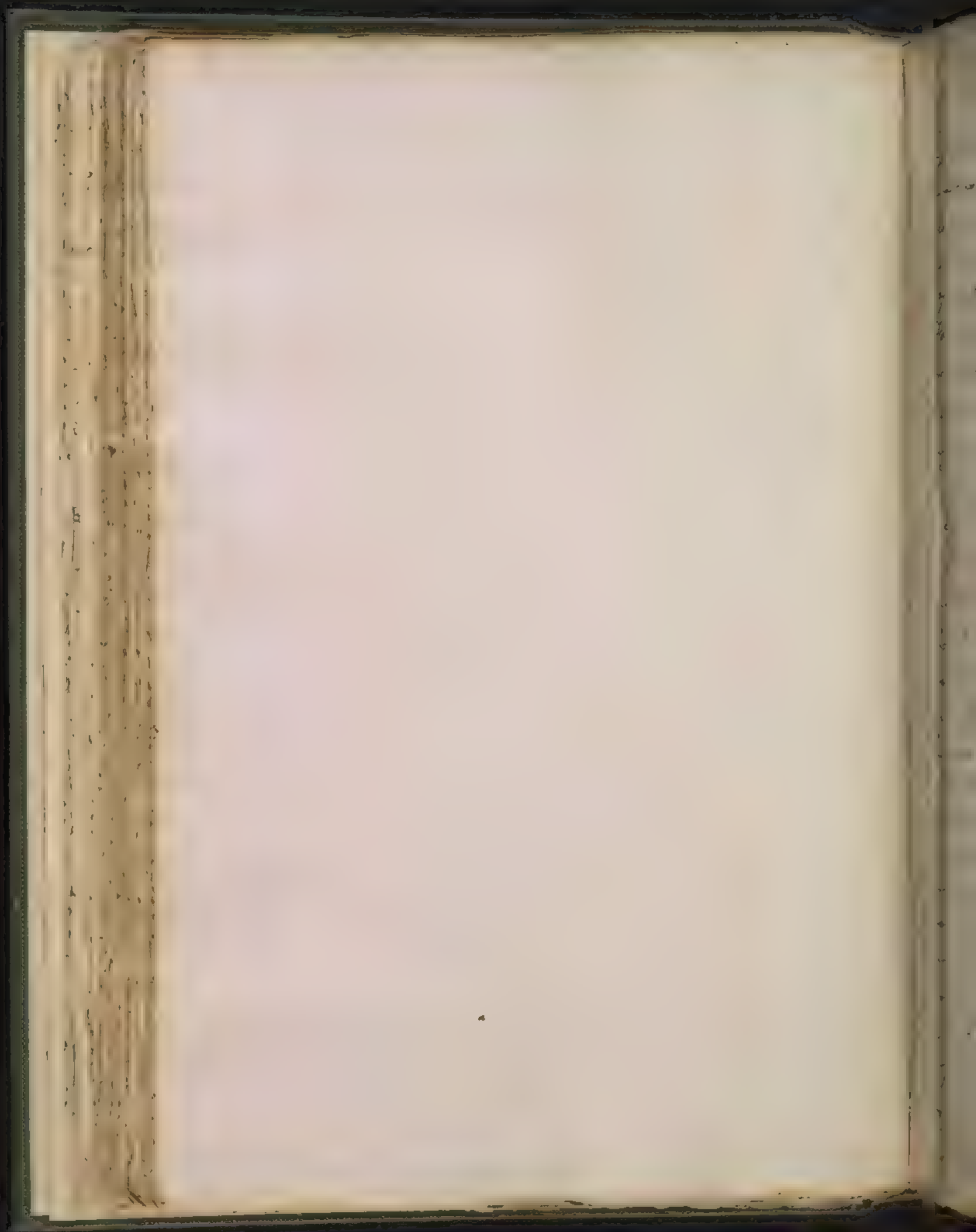
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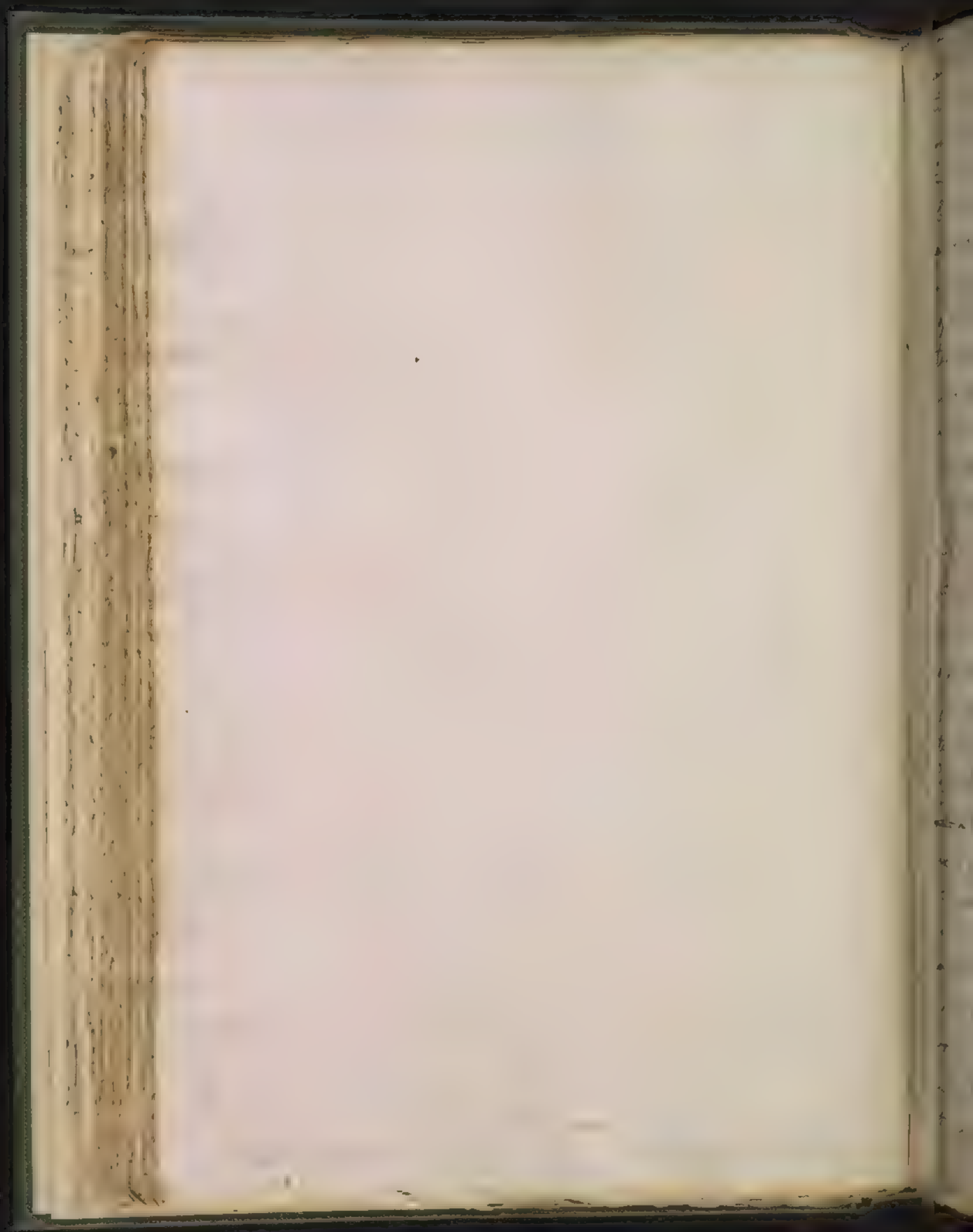
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The first part of the paper is a
 description of the general character of
 the country. It is a country of
 rolling hills and valleys, with
 a few scattered trees and
 small settlements. The soil is
 generally fertile, and the climate
 is mild and pleasant. The
 population is small, and the
 people are generally well
 educated and industrious. The
 principal occupations are
 agriculture and stock raising.
 The principal towns are
 situated in the valleys, and
 are generally well built and
 comfortable. The principal
 roads are well kept, and the
 communication is good. The
 principal rivers are the
 River of the South, and the
 River of the North. The
 principal mountains are the
 Mountains of the South, and
 the Mountains of the North.

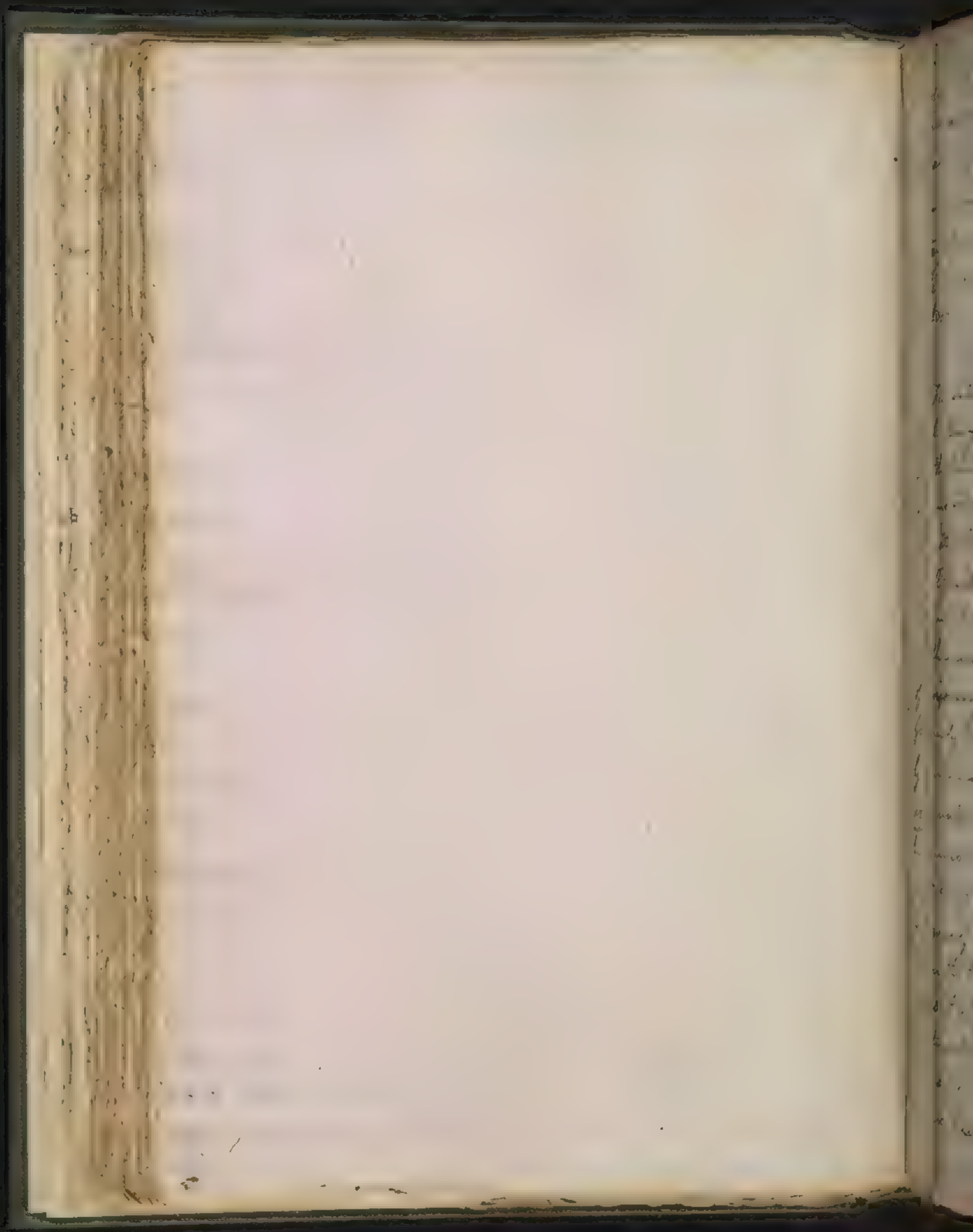
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... the number of ... it was found to contain
... for the heat ... the ... the
... the ... is not ...
... the ...
... after the heat
substance become ~~quite~~ somewhat ...

... in it and afterwards noted the degrees of heat
in a given time. From this he calculated backwards
and thus found the degree of heat in the body when
first taken from the fire. At the time of ...
as to find out the time which bodies take to ...
... and in what proportion they lose and receive
heat. To do this ... it is necessary that the
heating and cooling masses should be the same ...
the body should be exposed to a current of air
for when this is not the case air is circulated round the
body and hence it will not cool so fast as it ...
would. He may here explain the reason why still air
appears hotter than air in motion. If air is a state
... it receives heat from our bodies and accumulates
it around them, but when it is in motion ...
the warm atmosphere from around us and
hence windy weather generally seems the ... But
it is not ... as ...
... a pair of bellows against a thermometer ...
the mercury in the tube ... the heat
on the ... heat generated



the action of the wind upon the wood but it is, the
to produce this action the wind must be very warm
as the air upon it melted is melted sooner than when
still air viz. by the cold air around it, which is cold
and remains so, and it is, then
constantly supplied with warmer air.

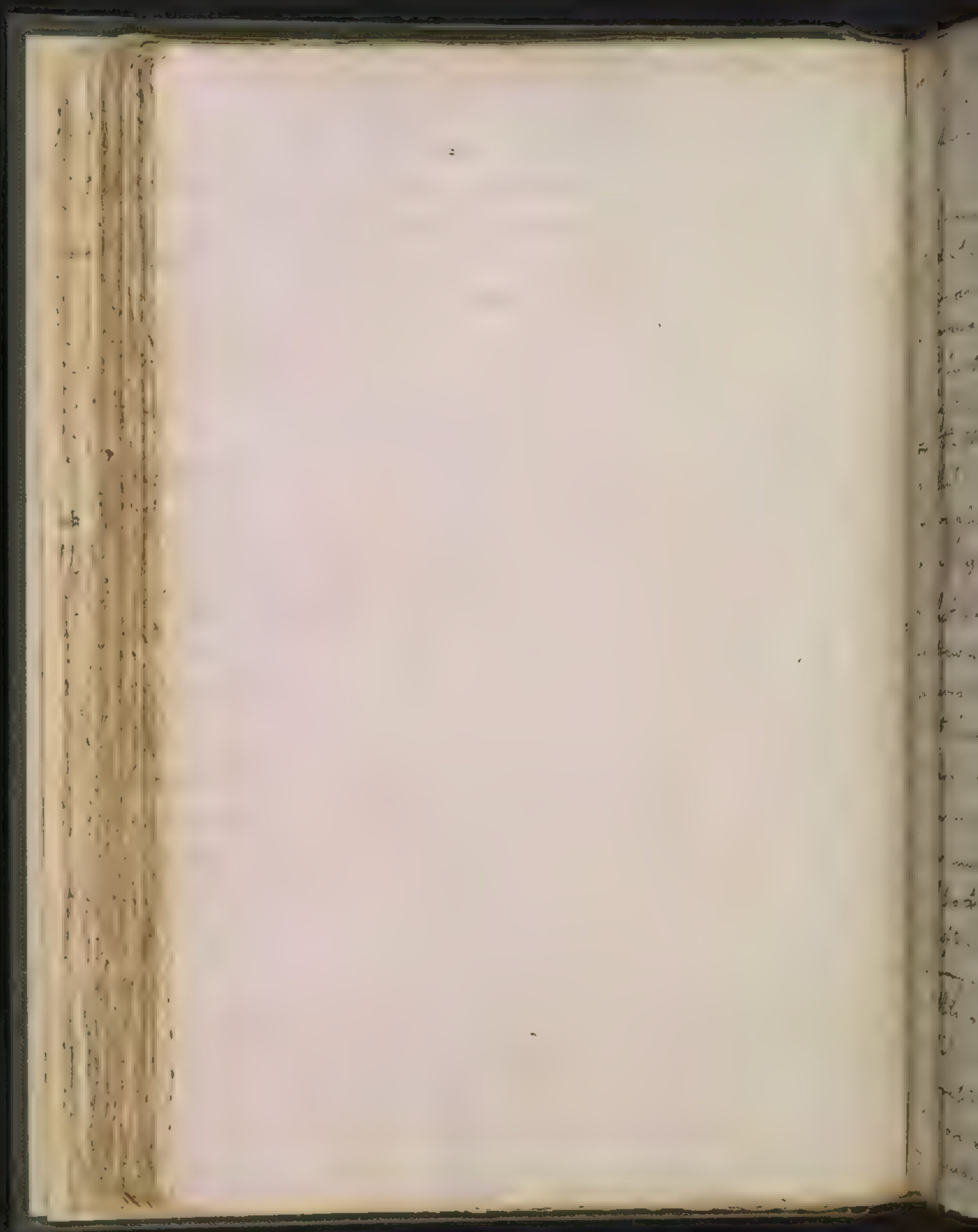
The reason of the action of the wind upon the wood
is, viz.

Of Fluidity.

Fluidity in all bodies is the consequence of the action
of heat. Many reasons concur to establish this assertion. We
find that many bodies naturally solid, become fluid
by being exposed to heat, and on the other hand, some
are naturally fluid, and become solid by cold. Heat of fire
and other do indeed remain fluid in any degree of
cold which has been yet produced. But I have no doubt
but they might be rendered solid, could we not obtain
a sufficient quantity of heat, the mercury which was
formerly thought to remain constantly fluid has lately
been rendered solid by cold. There are some metals
as in nature or certain earths and stones which have
been made fluid by heat, but this is no argument of
their being able to be rendered solid, for there may be greater
degrees of heat than we are yet acquainted with.
From the experiments that have been made, it
seems it appears, that at a less might be so
constituted as to melt the hardest bodies in nature
especially if certain substances were added
to them. By the account of one informed
that



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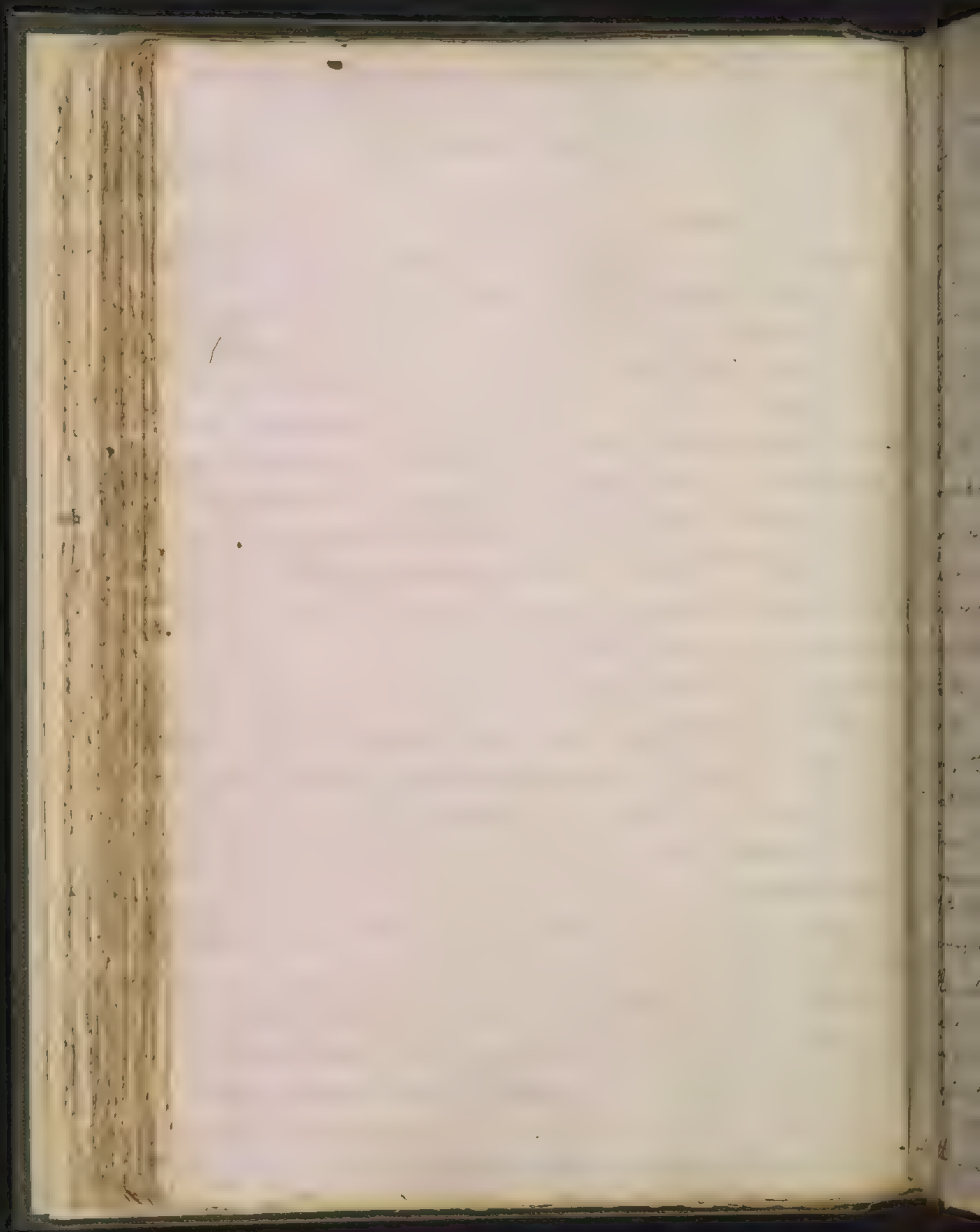


soils on a rainy day it is a warm moist soil. But
if it is raining on a rainy day it is a warm moist
soil. But on a cold day it will be a cold moist soil for
days.

3. It is observed that in some places the Mercury
stood at 30° or two degrees below the freezing point.
This we do not deny. It might have been owing to
a considerable frost preceding and in some places
water parts with its heat or we should see the effect
throughout likewise or been owing to a considerable
thaw the thermometer being placed against a wall
and that being a long time in communicating and
receiving heat which is generally the case or the thermometer
might lie on a warm sandy soil.

4. That there is frequently a frost on vegetables,
straw or some light bodies when water can be
perceived on water. This is to be accounted for from
the Law of the communication of heat viz. That
the surface and bulks of bodies being given they
lose or receive heat in proportion to the quality
of the matter. This frost is observed on none but
light bodies only.

5. It is often observed frost in April May and June
the very warm days, and holdly pronounced
that this can be accounted for in the water being robbed
of its heat. This may be accounted for from
evaporation producing Cold such sudden trans-
itions are very common and warm days are frequent-
ly succeeded by very cool nights.



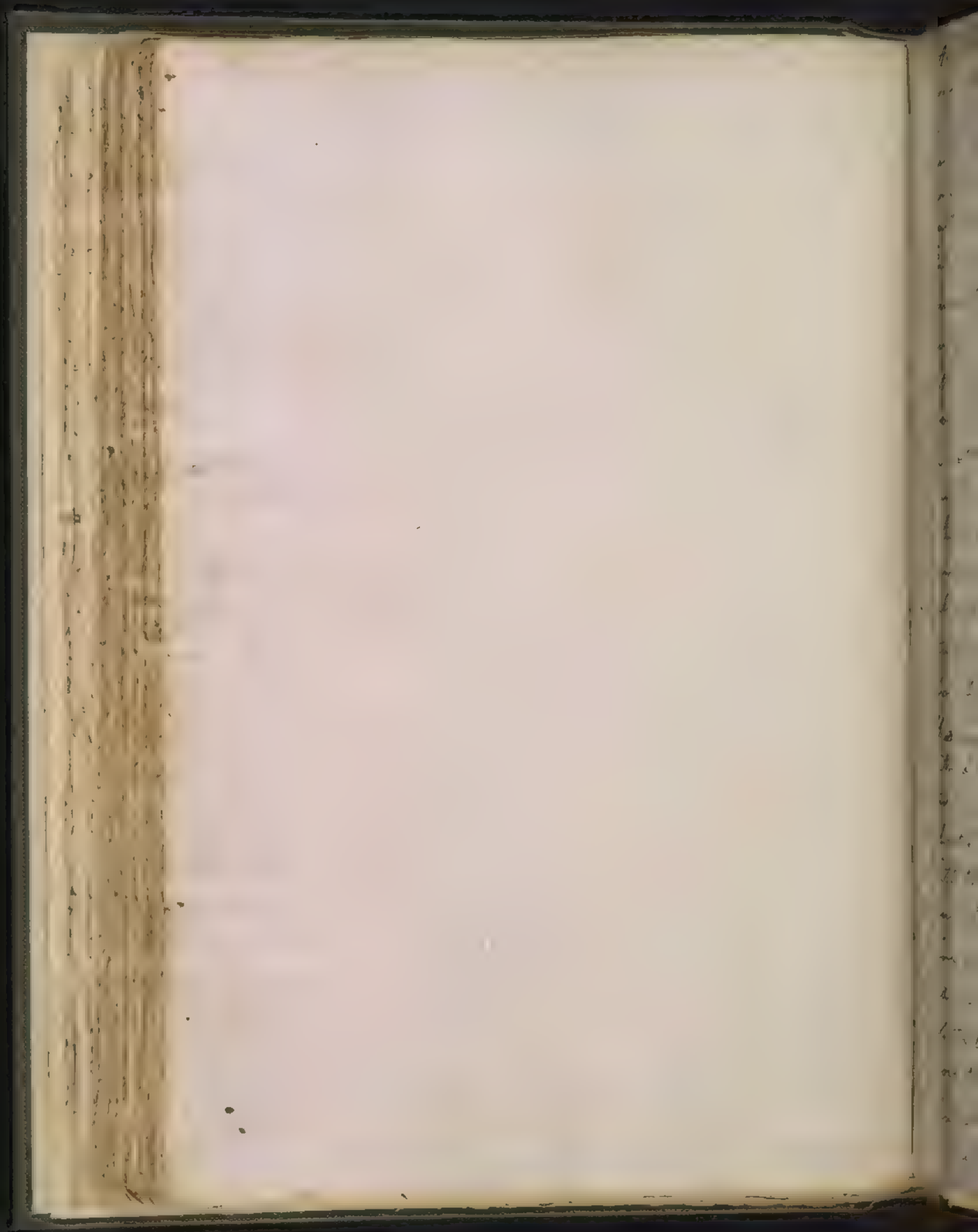
1. I have a large quantity of the same material
which I have used in the same way as before
and I have found it to be very good for
the purpose of the experiment.

2. I have also used a large quantity of the same material
and I have found it to be very good for
the purpose of the experiment. The degree of
the effect is the same as before and the air is in
the same state as before and the water is in
the same state as before. The air is in the
same state as before and the water is in the
same state as before. The air is in the
same state as before and the water is in the
same state as before.

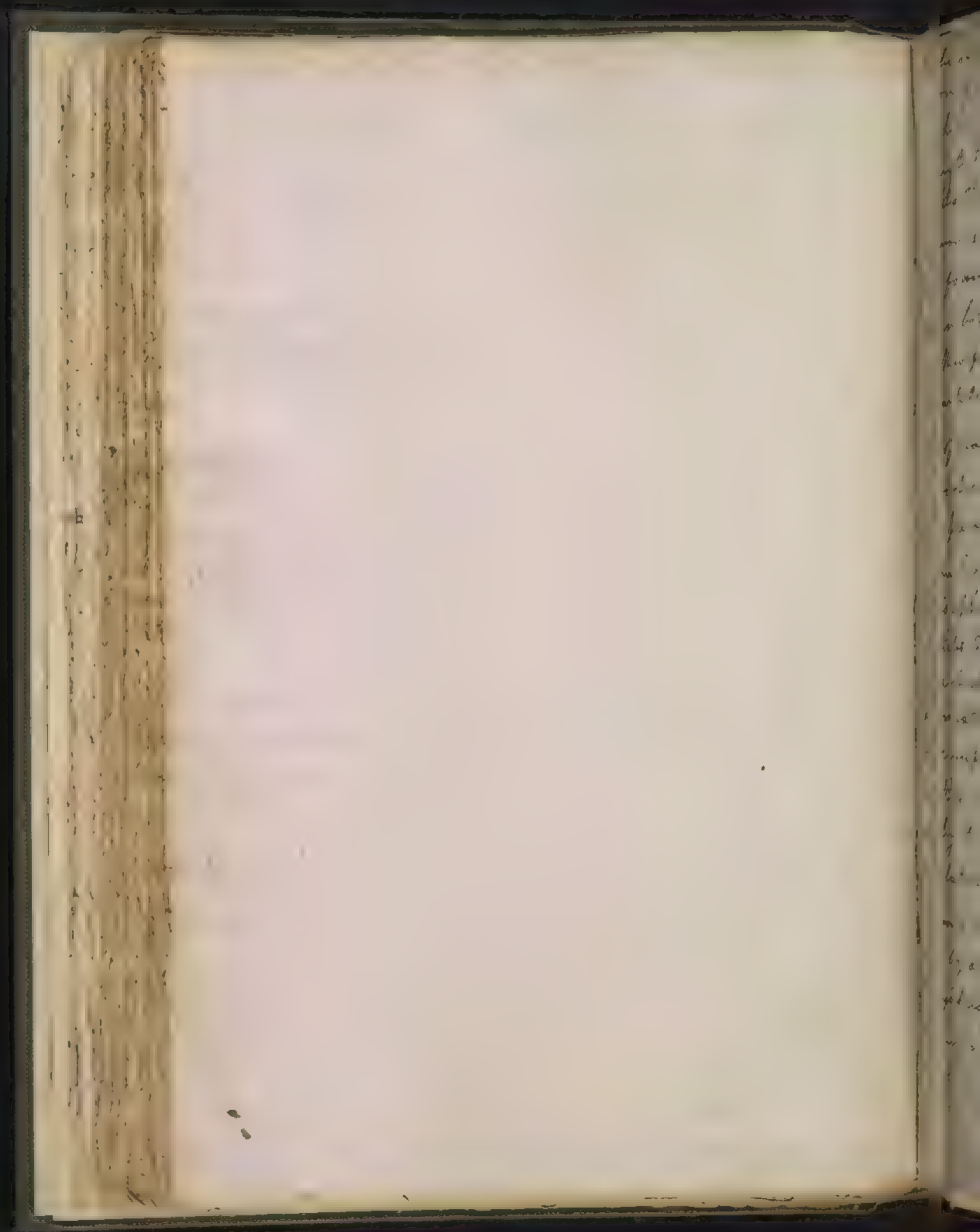
3. I have also used a large quantity of the same material
and I have found it to be very good for
the purpose of the experiment. The degree of
the effect is the same as before and the air is in
the same state as before and the water is in
the same state as before. The air is in the
same state as before and the water is in the
same state as before. The air is in the
same state as before and the water is in the
same state as before.

4. I have also used a large quantity of the same material
and I have found it to be very good for
the purpose of the experiment. The degree of
the effect is the same as before and the air is in
the same state as before and the water is in
the same state as before. The air is in the
same state as before and the water is in the
same state as before. The air is in the
same state as before and the water is in the
same state as before.

5. I have also used a large quantity of the same material
and I have found it to be very good for
the purpose of the experiment. The degree of
the effect is the same as before and the air is in
the same state as before and the water is in
the same state as before. The air is in the
same state as before and the water is in the
same state as before. The air is in the
same state as before and the water is in the
same state as before.



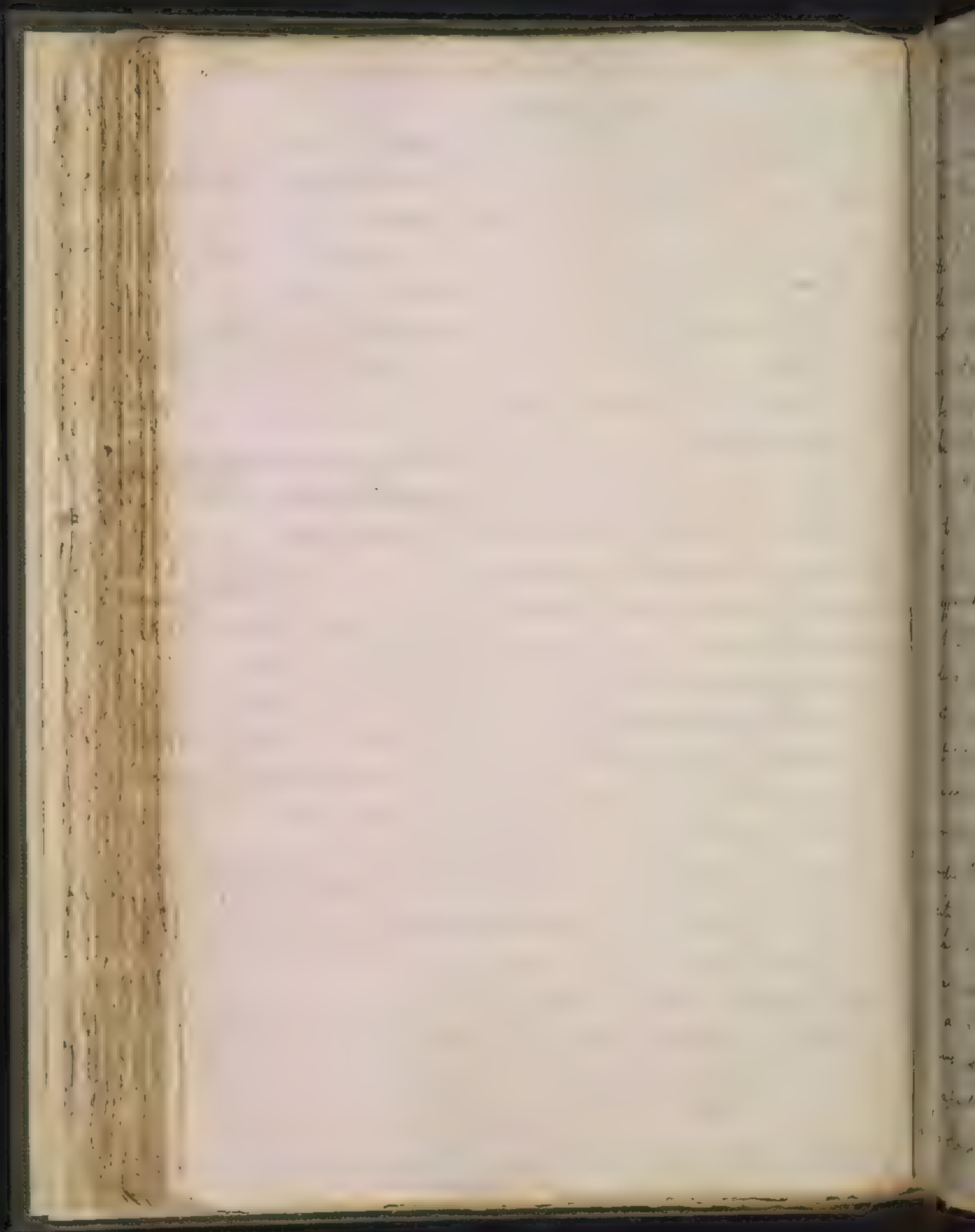
11th The water which the lake has become is hard until boiled
being in a state of superheated water. The water is, perhaps
... is in a state of ... By hard
water we mean such as will not easily be dissolved for the soap
or ... water is often very transparent and ... cold
... it is as soft as ... water
12th ... says that the ... of the ... are officiating
with a demon called ... Luis
... in ... it is ...
at it its to their ... water ...
... there was ... parties ...
... was ... a ...
... on the ... water ...
... in this ... water ...
... of the Andes ... water as freely as they
... from the Alps.

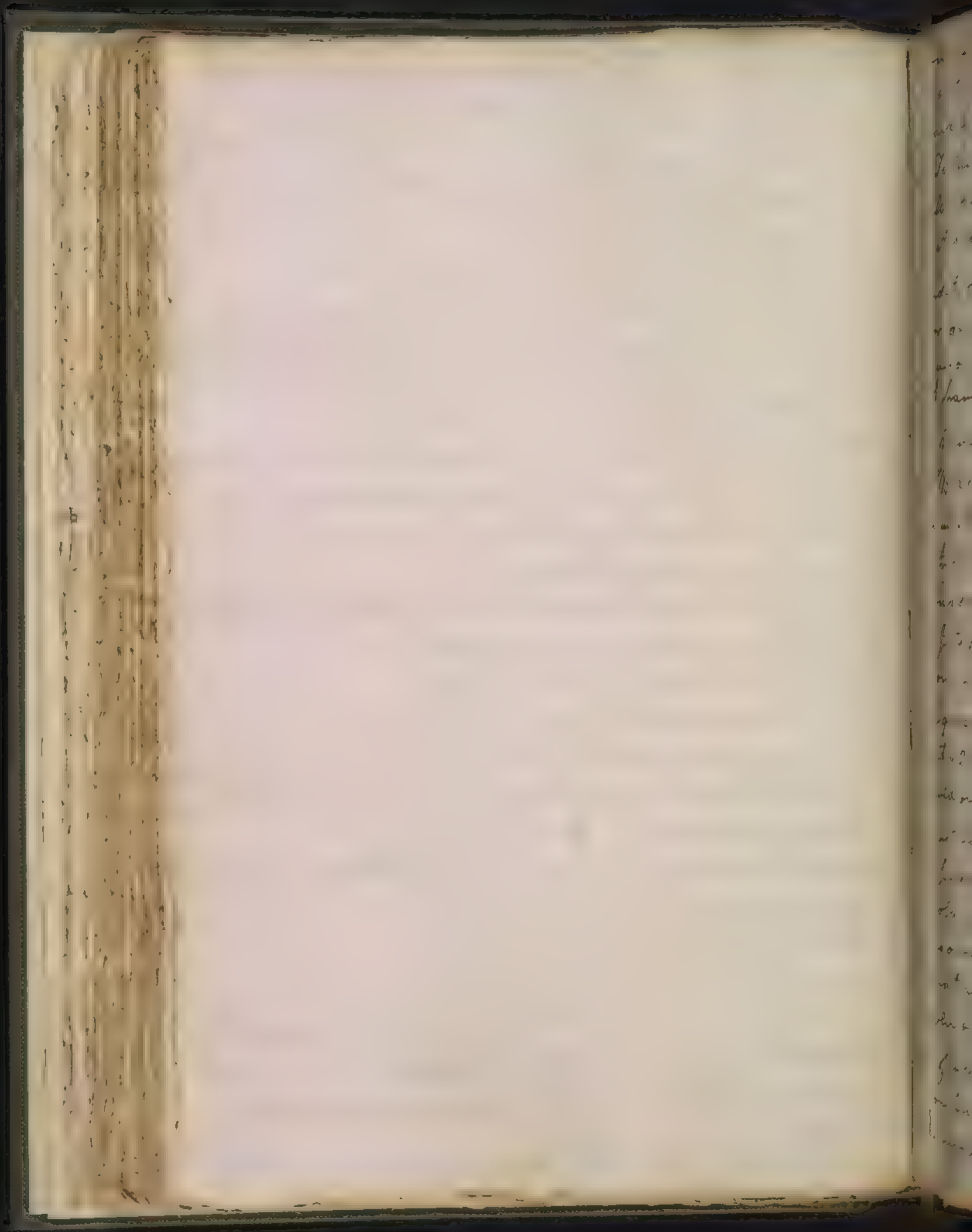


this be owing to some extraneous matter but to the absorption of some frigorific particles? A man is not heavier than water - This he allows but says it is owing to the extreme minuteness and subtlety of these particles. He did not consider that regular expansion and iron expand in passing from a fluid to a solid form. Can these cooling particles enter into these substances when they are red hot? No, therefore it therefore be owing to the absorption of frigorific particles but depends entirely upon the absorption of heat. The reason why iron expands we have before observed is owing to a crystallization taking place consequently interstices must be left.

Dr. Boerhaave in his Commentaries on Boerhaave's aphorisms admits this theory of frigorific particles. Hence in shaking of that kind of liquor where such comes from humors being so red bitter, he advises also to use of snow and ice which he imagines prove useful by extracting the frigorific particles but it is not true as before. The nature of this kind acts by stimulating and producing a vigorous circulation in the foot better than the Dr. Boerhaave's all over is just as in the obology of a frozen apple, by attracting the frigorific particles which may be seen in the form of ice in the surface of the apple. But we

must not be mistaken in supposing that the same will be the case with other vegetables as we have seen in the case of the apple.

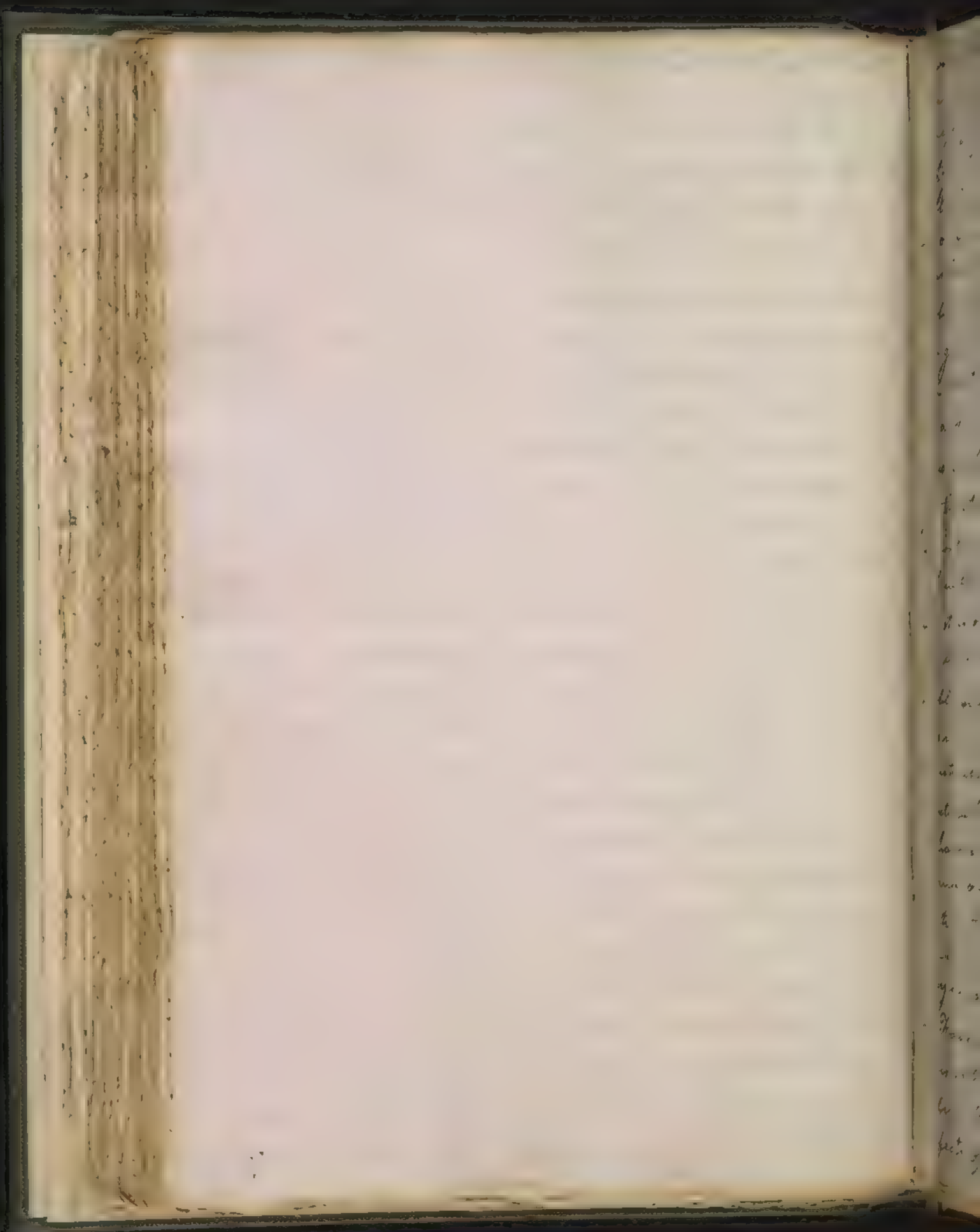




Those bodies that do not assume their former shape
once but become smooth and transparent after fusion
are said to be vitrified or to have undergone vitrifica-
tion. To this class belong earthen stones and
metallic bodies. And when metals undergo this opera-
tion it is called scoriafication.

Fluidity depends upon the presence of matter in a so-
lent or quiescent heat as well as in a sensible state.
This unusual property by which heat diverts itself of its
most characteristic mark that of being perceptible
to the thermometer or the senses was first discovered
by Dr Black. He has observed that heat exists in two
different states. one he calls absolute or latent heat
and the other sensible. To illustrate this he made the
following simple but conclusive experiment. He took
seven pots of the same size and heated them red hot
into one he put a pound of water into the other the
same quantity of ice. He found that the water received
presently 212° of heat, but ice after melting had
acquired only 140° of heat. He concluded therefore that
 72° must have been ~~lost~~ absorbed and become latent
in the change of the ice from a solid to a fluid state.
He could give it by the solution of ammoniac
and is owing to the conversion of sensible into la-
tent heat and the heat arising from the mixture of
nitric acid and water is occasioned by the conver-
sion of latent into sensible heat.

From hence we see the reason why the weather is gene-
rally moderate before a fall of snow or it must in
its



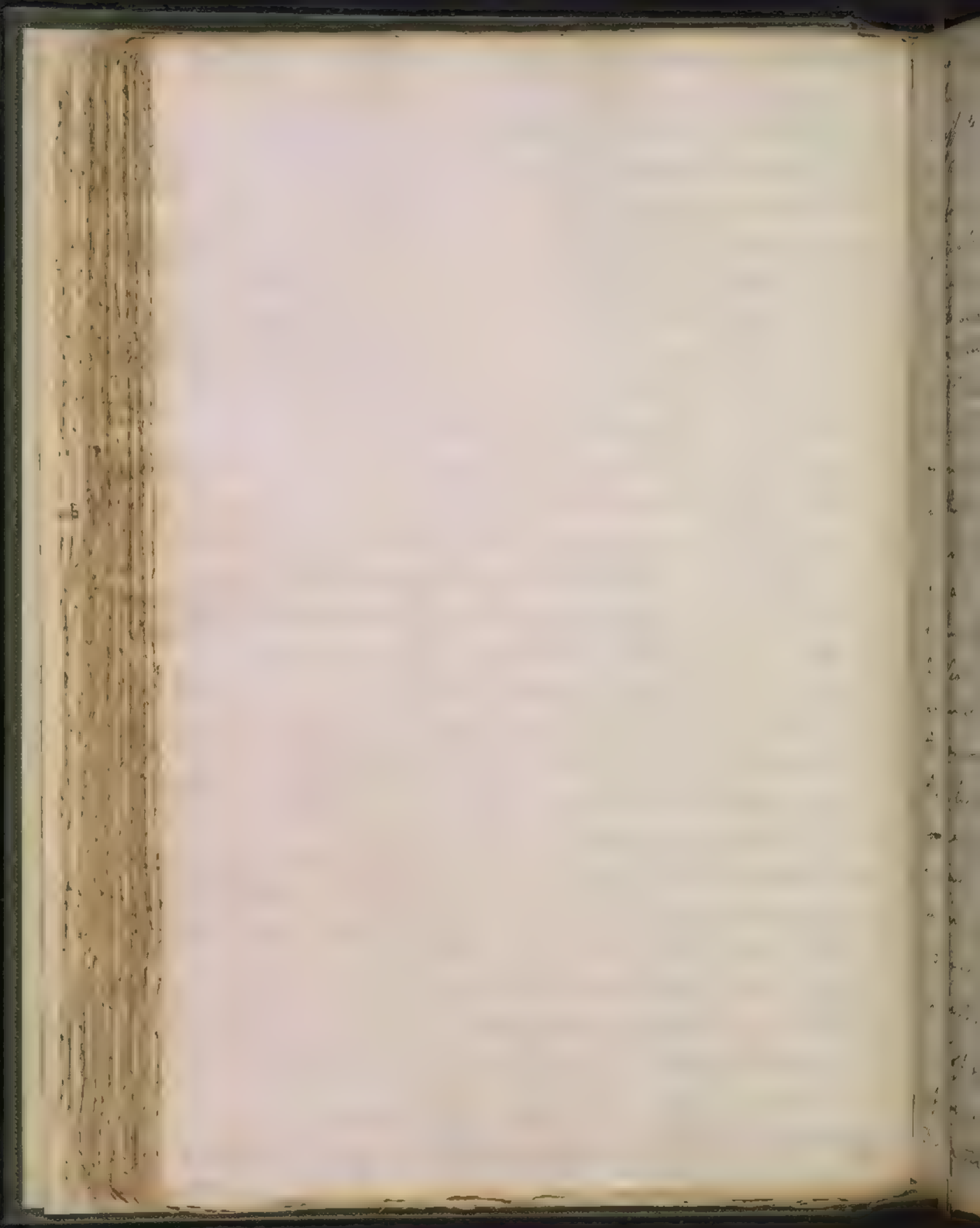
to be a part of the great family of nations. It is
 given to us by the Creator, and it is our duty to
 use it for the benefit of the whole world. We are
 to be a part of the great family of nations, and
 to be a part of the great family of nations.

It is therefore a very likely character of that
state of government that the ocean will be so
vastly extended, that by the increase of the water to
such an extent that the earth will be completely submerged
the great danger of the general inundation. There
is no doubt that the water is now in a state of boiling
up, and when they observe that the water of the sea
is now boiling, it will prevent the effects of the fire. So far
from this it is probable that the ocean may continue
to its boiling, because the fire that is destined to wash the
earth in flames at the last day. To begin the dreadful
scene it is only necessary for the great Creator to let
go the chain which confines the ocean its immense
movable quantity of latent heat.

It is now to me a barely rounded the history of old and
it appears upon several of the objects of Chemistry, we shall
have extended these the one more viz. Animal Bodies

We have a broadly spoken of meaning the degrees of
heat and cold. We shall now mention the method
presenting the same for the desired effects of cold.

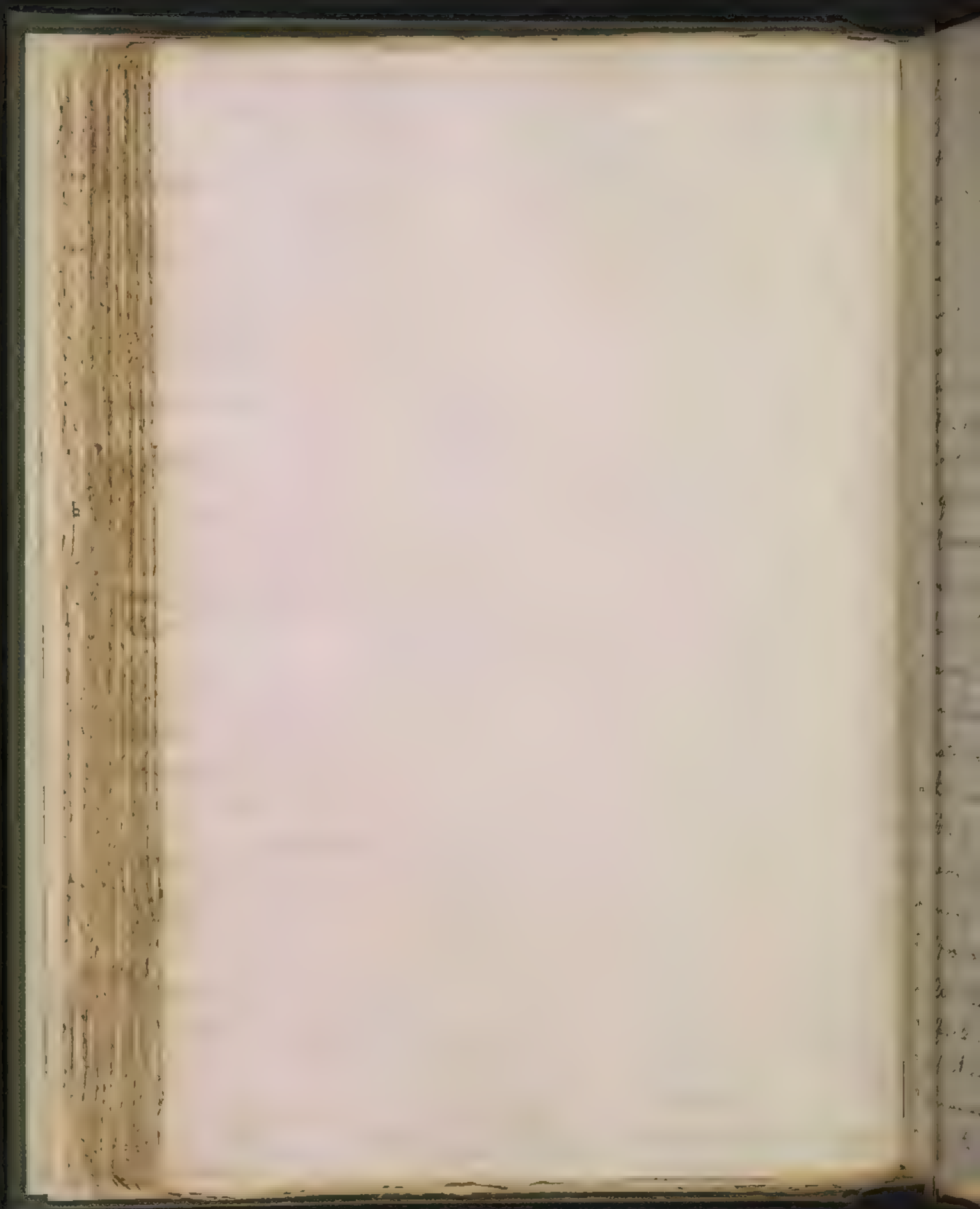
The human body is so contrived as to receive our uneasy sensations of Cold when the Mercury falls below 12° of Fahrenheit to the zero point. This means up or means as the Mercury descends untill it be near the zero point. Animal bodies have a power of resisting the effects of heat or cold to a certain degree, the heat



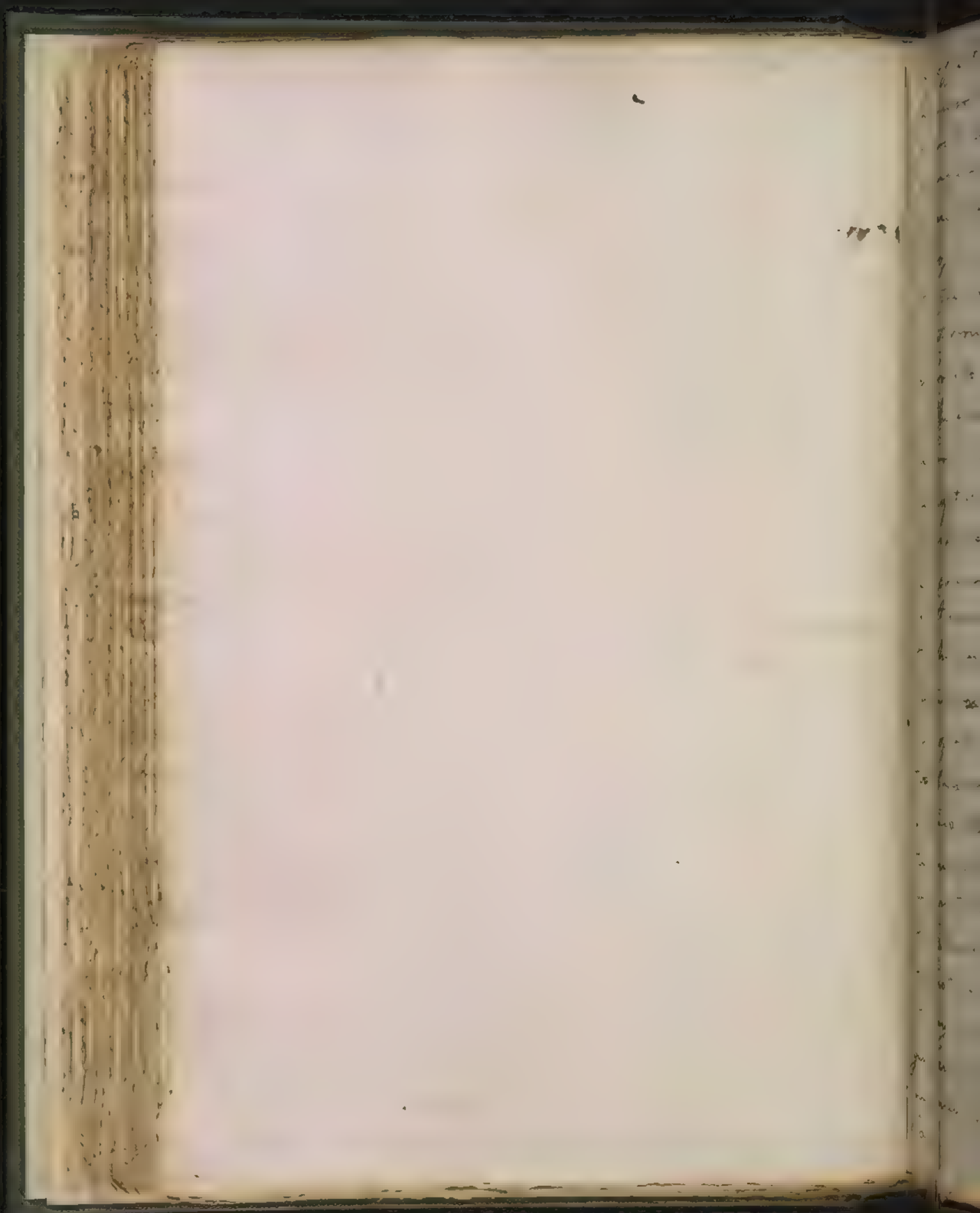
when and cold in winter the air is often so cold as to be almost
in the system and thus the means of operating the system
lost effects. But sometimes the degrees of cold are too power-
full to be overcome by the efforts of nature or art. In such cases
therefore we must call in the aid of art. And it will be
planning to the philosopher to employ the means we
now by employed for this purpose produce their salutary
effects, and when are too weak we must endeavour to im-
prove them.

The 1st Method we shall mention is the use of the Cold.
Both. We need not address the Indians of this continent
overmuch of the utility of this practice. All know that
in the Cold bath agree to it under the system
of merit of cold. Hence it is used to fortify children
and by the vigorous it gives to the system more
and more life. The effects of cold

2nd Wearing loose garments of fur or Wool. Thus
we are apt to imagine we warm ourselves; but
they are only so from transpiring heat freely
than human skin. In loose garments were
formerly used worn by the ancient Romans
and even now by the inhabitants of Asia or being worn
more in winter - and cooler in summer. They are
warmer in winter - by covering the perspiration
in its exit. When the perspiration is cover-
ed off quickly the body is kept cool. Hence the
difference between windy and calm weather.
Hence the reason why different persons are so

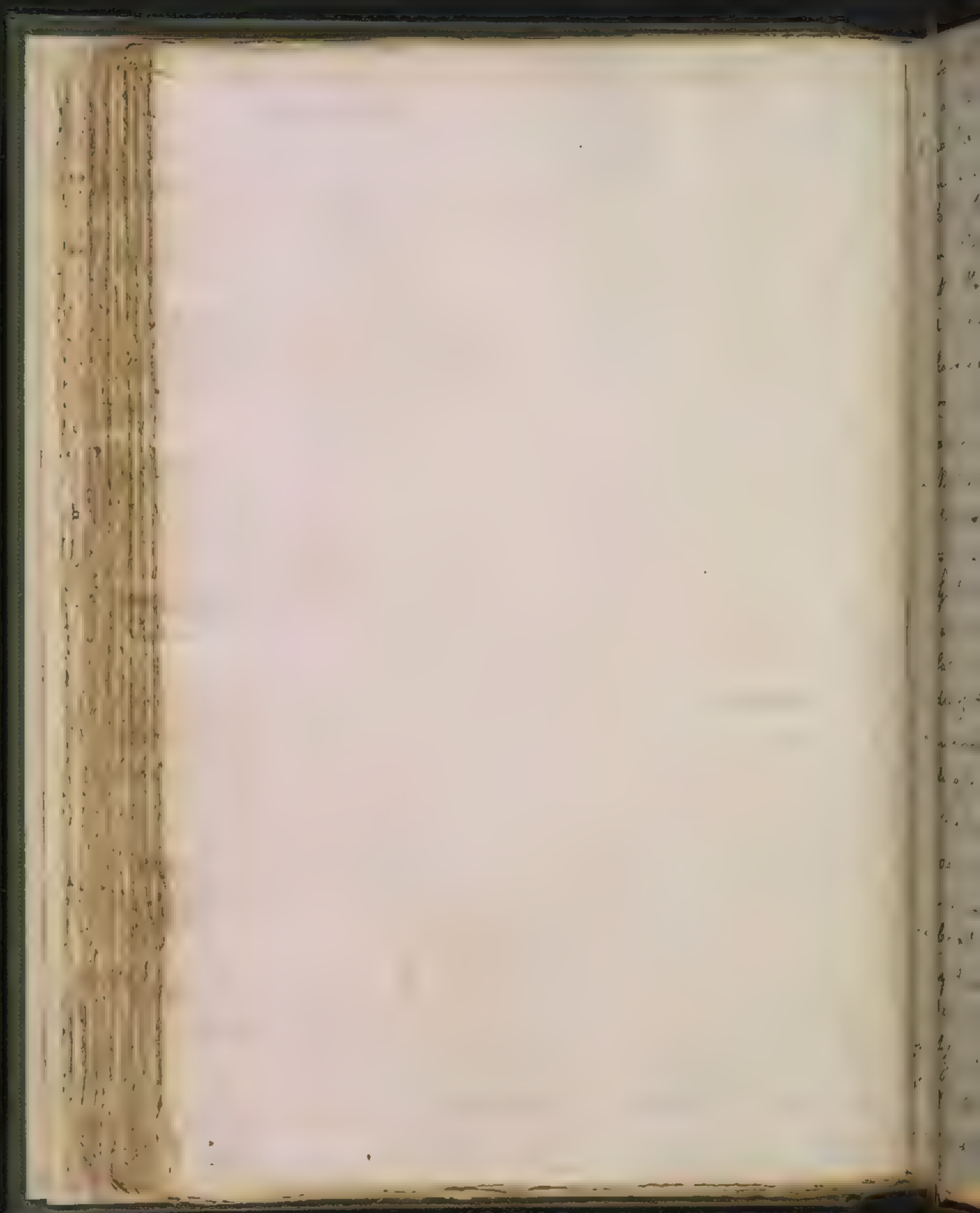


The first thing I noticed when I stepped out of the ship was a cold that was not just in the air but in the very bones. The thermometer showed a temperature of 66° F. but the wind was so keen that it felt like a hundred degrees below. I had heard that the climate was not so bad, but I had not realized how much the wind would affect the temperature. The first day was a very quiet day, and I was not able to do much work. The second day was a very busy day, and I was able to do a great deal of work. The third day was a very quiet day, and I was not able to do much work. The fourth day was a very busy day, and I was able to do a great deal of work. The fifth day was a very quiet day, and I was not able to do much work. The sixth day was a very busy day, and I was able to do a great deal of work. The seventh day was a very quiet day, and I was not able to do much work. The eighth day was a very busy day, and I was able to do a great deal of work. The ninth day was a very quiet day, and I was not able to do much work. The tenth day was a very busy day, and I was able to do a great deal of work.

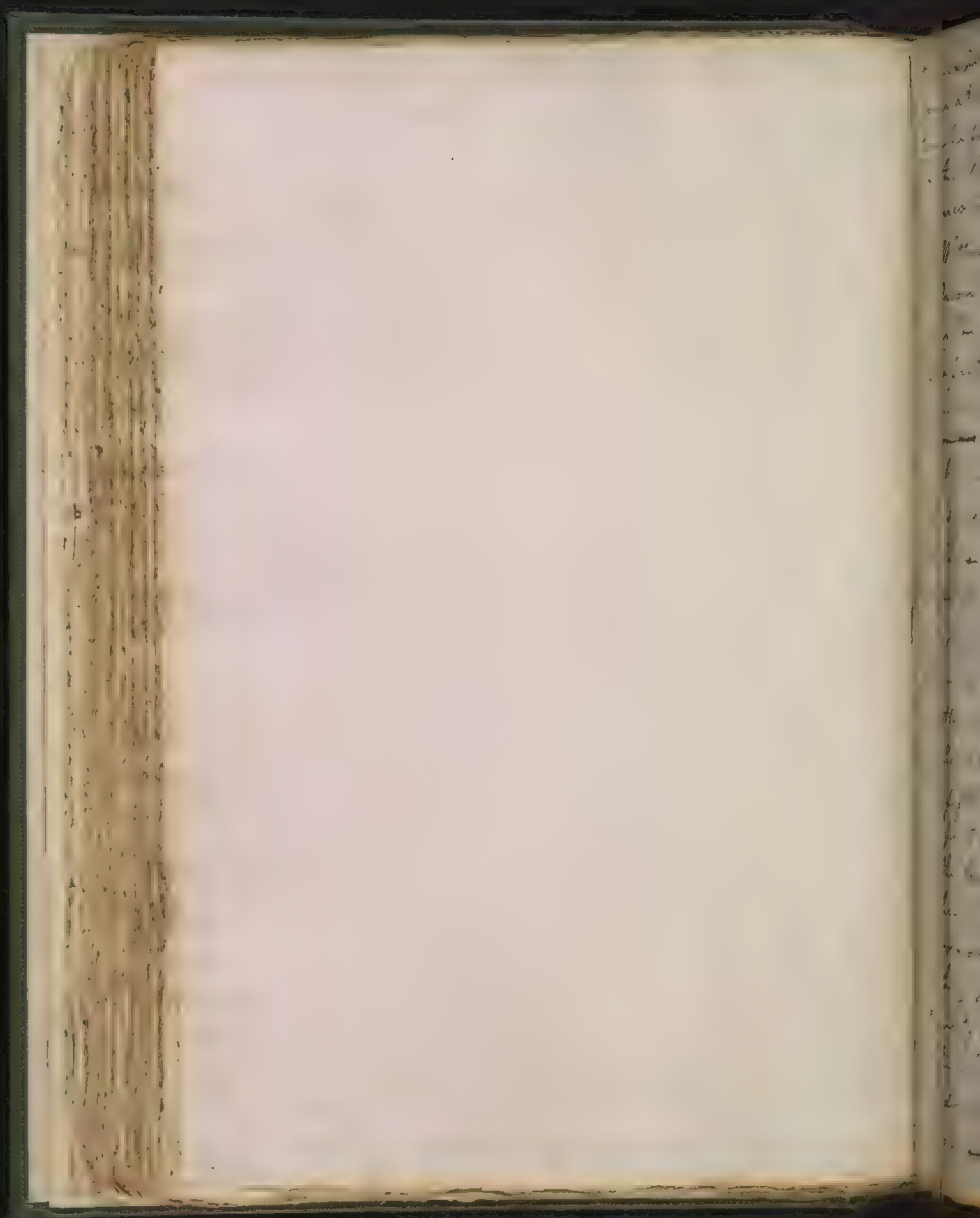


The defect of procuring immobility is cold. Hence
the reason why we cannot bear the cold of our climate
so well, because the heat of our summer is not intense
enough or does not continue for a sufficient length
of time is for to us against the coldness of winter.
I require less heat here in the West Indies
than the natives. This suffices in its support an argu-
ment brought in favor of the Slave trade or taking
negroes to the west indies. If an European escapes
for the first year in all common work than would
negroes. The country from which the Negroes come
however it is so fruitful that almost every necessary of
life is spontaneously produced. The inhabitants live
there on without labor. Labor in warm climates
is not conducive to the life of a man and it appears
that he was not destined for it in these circumstances
by the Creator. It is granted that the Na-
tives of cold climates bear heat better than the Na-
tives of warm climates yet it will not so readily be
allowed that the reverse takes place. Thus it is
the common opinion that new Guinea negroes
will not bear the cold of this climate so well as
the natives. It may be observed that this does not confirm
this notion. The circumstances that gave rise to
it may very readily be accounted for by that lan-
guage and deficiency of spirits which are the natural
consequences of Slavery and to their being badly
fed.

The



...with it that is to keep the feet warm. The effects of
cold are here first felt on account of their inactivity from
the heat and train. The Indians seldom experience any in-
convenience from sleeping in the open air if they have their
feet to the fire. There are several ways of keeping the feet
warm, 1st by wearing loose coverings to the feet, for this is done
for the Mohicans and Indians. There is one more well known
called in France do ~~the~~ in 1759 the soldiers who wore the
Mohicans had it in their feet frost bitten. But there
was one who was not injured by it. He was a Frenchman
of a different complexion. He was a Frenchman and was
not. But I do not know the reason, so I cannot tell
mit of motion as walking on a river in ice, if it is
more than one in a company. The method used
by the Indians of the Delaware is that they may be used
with no change. He attempted to cross the Delaware
Boat late in the evening but was frozen to in the
middle of it. The boat was full of blood and there
was an appearance of melting. He and his feet were
exceedingly cold. To remove this he pressed off his boots
and put his feet against the heavy man's breast after
lying down in the boat. After the heavy man to
come to him and covered both with his
great coat. After a while they both as sleep they slept
all night and the next morning the man arose in the morning
and went to his house over the river. I am another
fact. A gentleman was walking to town late
at night. He was overtaken by a heavy storm of
snow and lost his way. He laid down at the foot of



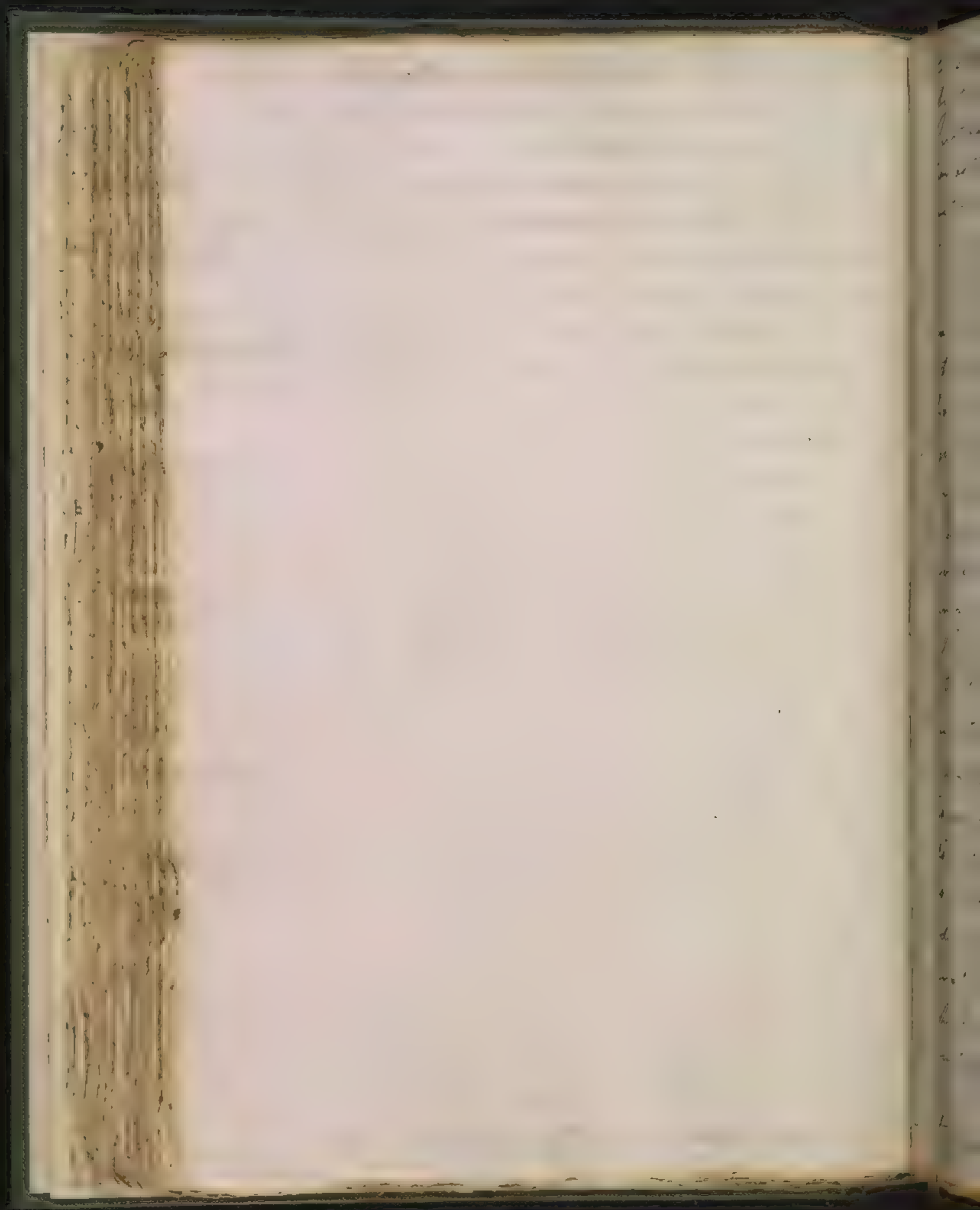
time exhibiting certain death. His Dog came and laid
down at his feet as willing to share his fate after some
time he found his feet warmed and he fell asleep.
In the Morning he awoke covered with snow and
pursued his journey to town in perfect health.

3. ⁴ Wetting the feet in cold water or plunging them in snow thus exposing them to a greater degree of cold. The Indians break the ice and plunge themselves. New Britain to looks to warm them when they begin to grow cold.

You are a student of the most excellent of all sciences - the science of life. You are a student of the most excellent of all sciences - the science of life. You are a student of the most excellent of all sciences - the science of life.

The fifth Method is wrapping up or mullen of the af-
fected part with ice or snow. This is a common Practice
with the Spanes, Russians and other Inhabitants of the
Northern parts of Europe. The action of this may be
understood from what was just now said

12thly. on a person is induced the utmost
extremity of Cold and has become torpid and insensible
the common practice is use frictions and to
cover the patient with warm flannels the common is in no
manner omitted yet it will frequently
hinder

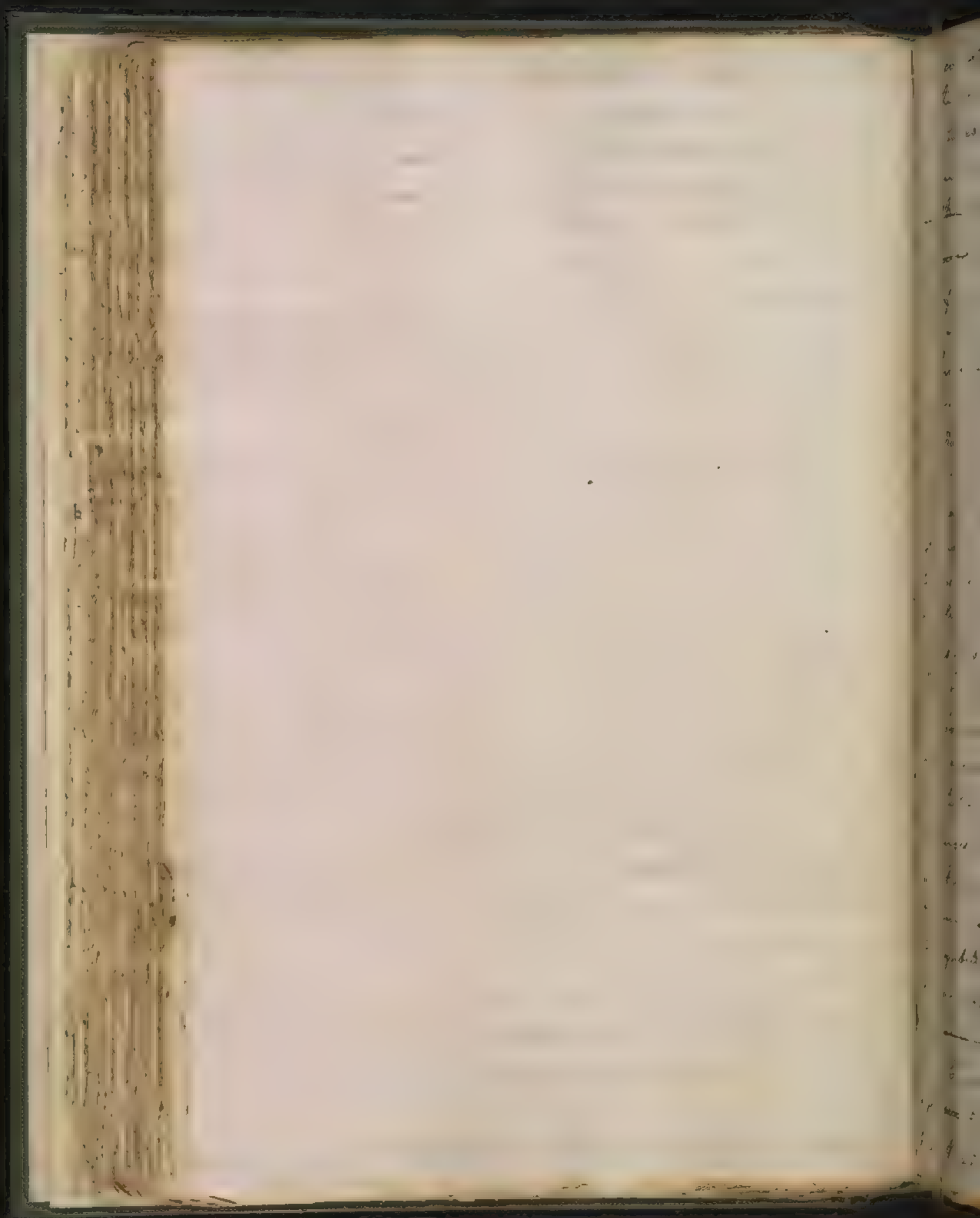


I have been thinking of you, and of the
 way out to some new place, and these things have
 been in my mind of some distance, was so reminded by the
 fact that he felt from the horse. After some time he awoke
 with a noise of something and jumping. He recalled
 that just before the fall he had a very good of it, and
 it was then that he supposed he had a better one, and
 had been standing in one of the as it should be.
 preservation of his existence in this world.

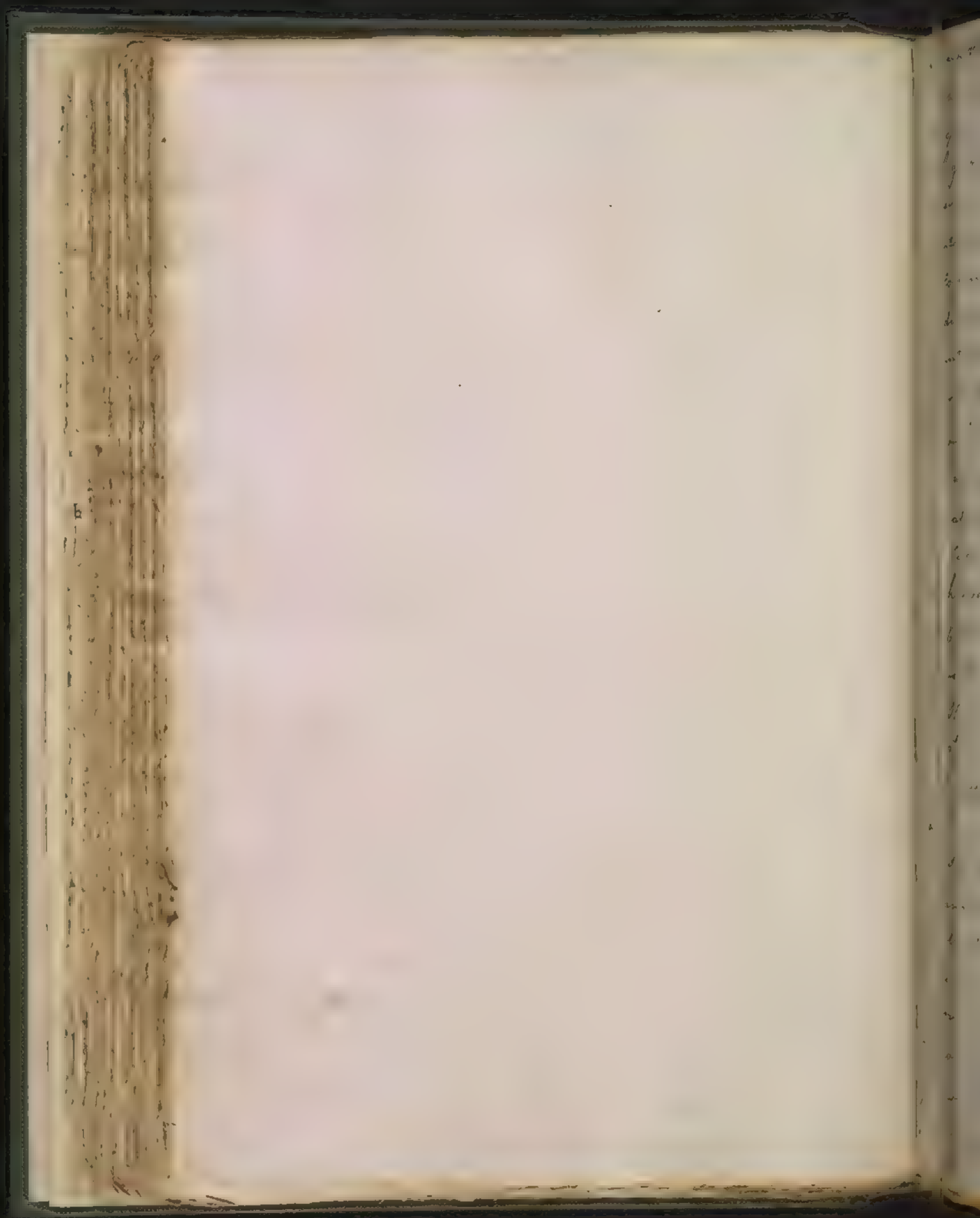
There are two facts which it is to be expected explain
1st why a damp day appears colder than a dry one
even though the water for a time to the same degree of heat
the motion in the air acts as a conductor and carries
off the heat of the body. 2nd why the sun's rays in summer
are greater on a damp day than on a dry one. The sun's rays
stand but at 71° than in a dry day. In the former case
the rays at 85° or 90° . In the latter case they are less
the sun's rays with water in the air. The sun's rays
are so much less in a dry day.

It will need some observations upon the nature of
the disorganised subjects that form the mass
only.

Dist. fr. $\frac{1}{2}$ again is to be, and to the attraction of
and



[illegible][illegible]



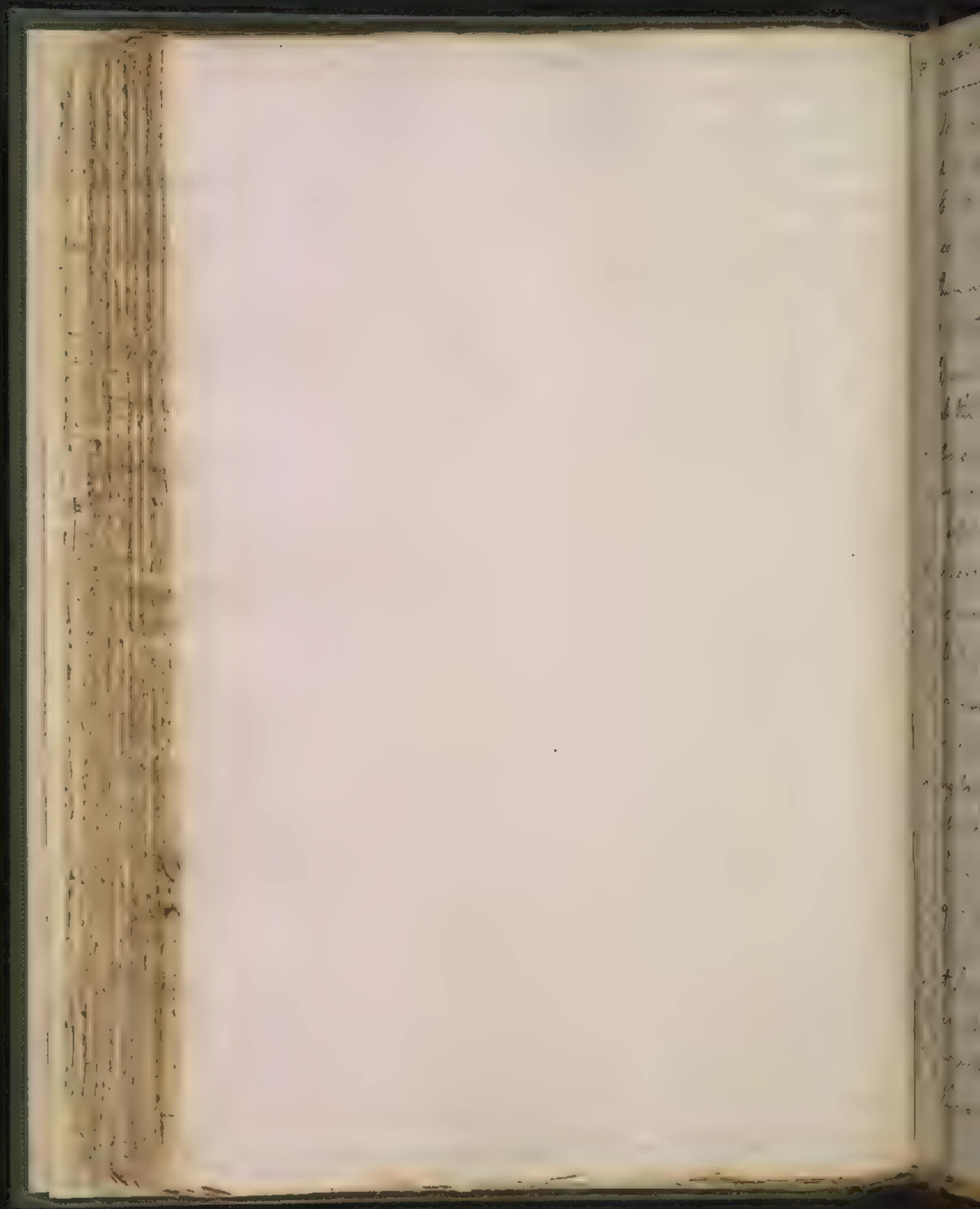
your up the chimney Bed Rooms particularly in old
houses as it is more for to sleep with the windows or
doors open. Such are not doing this without a chimney
fire, yet further and about that it is necessary to have the
nests even in the chimneys and that they are the only not so able
advantage of the preserving animals which will never you
could in a cellar under the same instances. Light, in
out do much sometimes produce diseases and in the
present produce, which diseases I have. Another means
regarding against the influence of the fact that at night it is
to be beds! But an not soft. It is not that as is proper
which do not increase the, but as to and then are not
so making up to the system.

The second method is by attention to the clothing. Every
body knows that the clothes should be changed immediately
and as they are, especially to the same many facts as to be
to have that the new at so as to some. The second next
to the skin as cotton or cotton wool. The linen
is not be changed frequently, the looser the outer garments
are the better, never go so far as to prefer all the light looked
coats.

The third method is by attention to the diet. It is not
a universal rule that a vegetable diet is the best, but
it is not that the diet should be such as to be
so as to avoid the too much of the same and
appears that a diet of food can be as good as any quantity
that the vegetable diet may be as good as any quantity
it is a way, a nourishment in the diet of a general
diet, to communicating effects, by the system, however
the

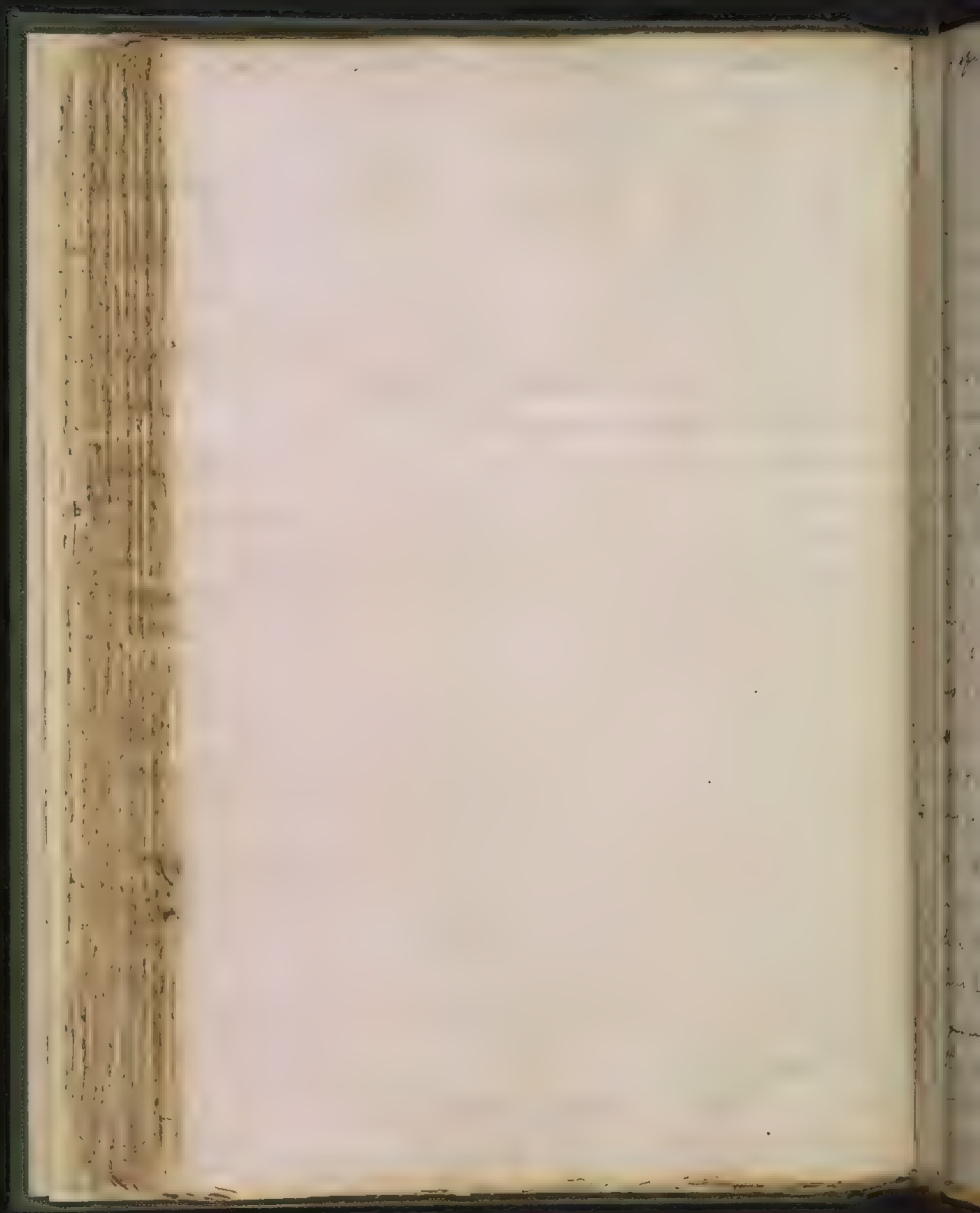
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Handwritten text in a narrow column on the right side of the page, likely a marginal note or a list. The text is written in a cursive script and is mostly illegible due to fading and blurring.



When he falls down his breathing is extremely laboured
as is extremely common in men in that state, his skin
is cold it commences an Italian horse on a slip of straw
and the patient dies. He may be relieved by rubbing
his cold water is the best application I will
succeed even when it is in the hand or feet by placing
my thumb on or by throwing luscious water upon the
head. But the best method is by throwing it by bucket
fulls, one after another and if from a height so
much the better, the colder the water is the better.
Frictions likewise should not be neglected by these
means many are relieved and they will succeed even
when applied to horses. Porters and others who use
their horses with great humanity. The first for
their horses is to give one or two in a row a blow
in the neck with a stick after they are recovered from especially
after a fall then give a few more by the application of cold
water. I can give you an instance of this where a horse after
falling down from the violent effects of indigestion was
revived by throwing 20 or 30 buckets full of cold water
upon him. I am not certain whether warm or cold water
acting as a stimulant might not have been so
effective. I have only thrown it out as
a hint. Once heard of a gentleman in this circum-
stance who was relieved by putting his feet into
very warm water.

We now ^{return} to speak again of the third gene-
ral



the effect of heat viz.

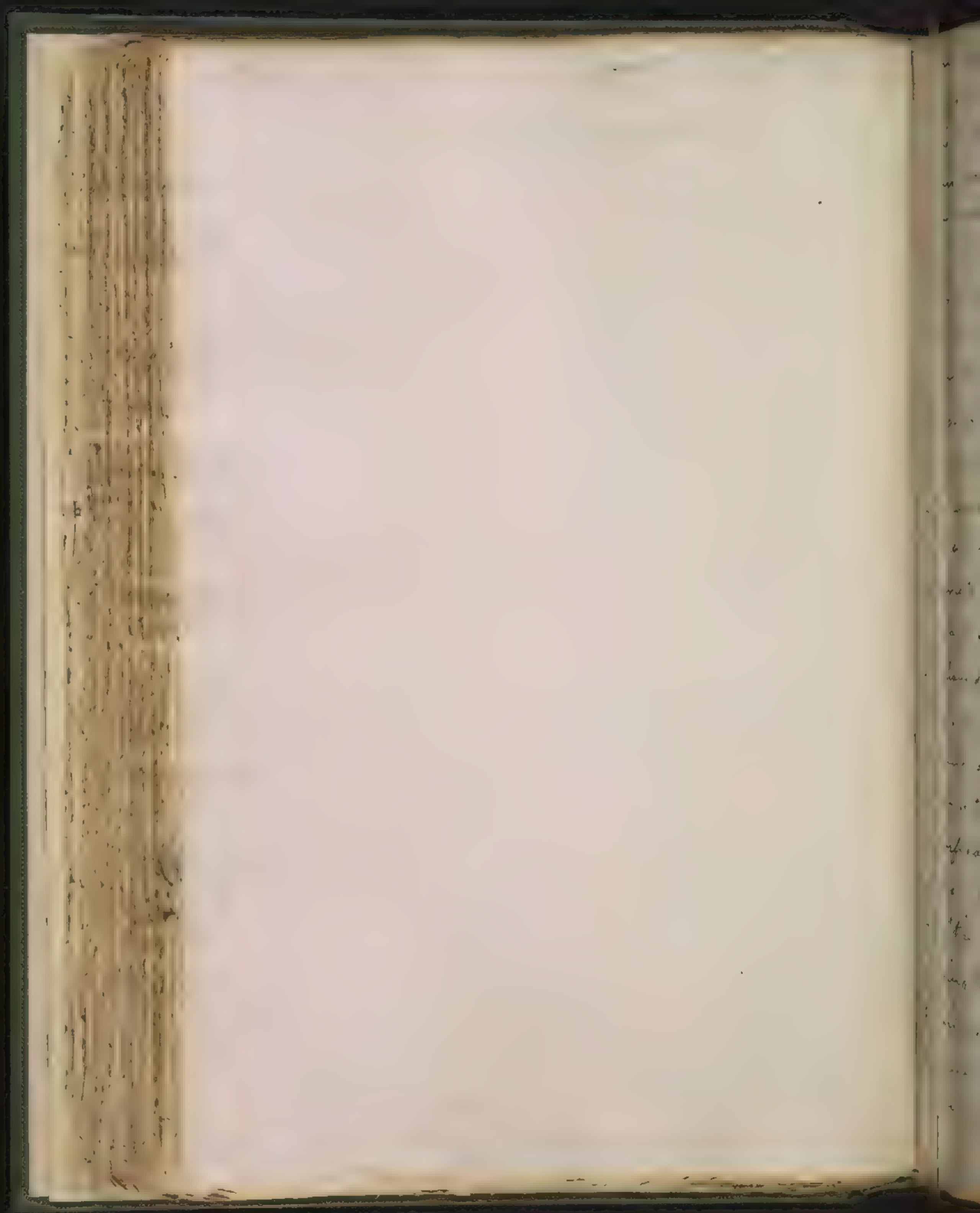
Of evaporation

The process of evaporation is a change from the liquid to the gaseous state, and is attended with a diminution of temperature. It is a process which is attended with a diminution of temperature, and is a process which is attended with a diminution of temperature.

Three properties of water are necessary for its evaporation. First, it must be in a liquid state. Second, it must be in contact with a surface. Third, it must be in contact with a surface which is at a higher temperature than the water. These three properties are necessary for its evaporation.

The rate of evaporation is affected by several factors. First, the temperature of the water. Second, the surface area of the water. Third, the wind velocity. Fourth, the humidity of the air. Fifth, the pressure of the air. These factors all affect the rate of evaporation.

The rate of evaporation is also affected by the nature of the surface. A smooth surface will evaporate more rapidly than a rough surface. A dark surface will evaporate more rapidly than a light surface.



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Handwritten text in a narrow column on the right side of the page, likely bleed-through from the reverse side. The text is written in a cursive script and is mostly illegible due to fading and the angle of the page.

in all bodies that come have at the point of
fluidity, that in some substances assume the form of
vapor before they become fluid, even under the common
temperature of the atmosphere, such as camphor and
sugar; volatile salt of arsenic and zinc.

We shall here explain a few chemical terms.
Evaporation is when the volatile parts of a body
rise and leave the fixed behind, as in the making of
sugar salt distillation and sublimation are
the reverse of the former. There are instituted to pre-
serve the volatile parts. When the product is fluid it
is called distillation when it appears in a solid
form we call it sublimation and it is, as we have
said, the reverse of distillation. Flowers of sulphur
are called flowers or distillates according to their
appearance.

The loss of weight in evaporation is not to be
accounted for by the escape of the volatile parts, but
by the greater weight of the water in the air, which is
lost in the process. It is observed in a glass of water
for two months and no change in weight of water is
made to be made by the common heat in the house, a burning
glass will increase the weight of the water, which
is therefore a proof that the resistance of
the air is owing to the inefficiency of the means employed
and it is concluded that there are no bodies in nature that
are proof against the evaporative force of fire.

Evaporation is mentioned above but occurs in the common
temperature of the atmosphere, as camphor and arsenic are
lost.

This image shows a blank, aged, cream-colored page, likely an endpaper or flyleaf of a book. The paper has a slightly textured appearance with some faint smudges and discoloration, characteristic of old paper. The left edge of the page shows the binding, with dark stitching or thread visible. The overall tone is warm and slightly yellowed, suggesting the age of the document.

[Faint handwritten notes, mostly illegible]

and Spontaneous. The vapor, produced by it possesses no elasticity and differs from that of water produced by heat. The greater the surface exposed the greater will be the evaporation. Thus a wet sponge hung up in the air soon becomes dry by reason of the great extent of surface. When the vapor is confined evaporation will take place only to a certain degree.

Vapor is always produced by heat and when this is abated it is again condensed. From this we account for the drops of water that are frequently observed trickling down the sides of such vessels as contain cold water as the vapor contained in the atmosphere is condensed on those vessels by the coldness of the contained water. This is illustrated by the condensation that takes place when we breathe on a bottle of cold water. This is also observed on the windows of bed chambers in a dry morning. Hence also the frost that is observed on houses and rocks in the midst of a general thaw; for the wind that brings on the thaw is generally loaded with north vapor which meeting with the cold houses or rocks is condensed. On the same principles we account for the production of dew. Rain &c. the ground being warmed during the day by the sun sends up a quantity of water in the form of vapor. This vapor condensed after sunset by the coldness of the air returns to the earth in refreshing showers. The rising of misty fogs from low marshy places depends



de, ends upon the same course. The unwholesomeness of
those lungs is owing to their nearness to the stagnant
water. Hence we see a very small quantity of water
is sufficient to produce the disease. The air in the
lungs is renewed in a very rapid manner. The
lungs, however, are so small that the air in them is
renewed in the space of a few minutes. The air
in the lungs is renewed in the same manner as the
air in the lungs of a fish. The air in the lungs is
renewed in the same manner as the air in the lungs
of a fish. The air in the lungs is renewed in the
same manner as the air in the lungs of a fish.

"Simultaneous evaporation has been accounted for
in different ways.

"Some say it arises from the air in the
fluid being heated by the heat and carried away. The
fluid in the form of bubbles. The argument is
from the rising in the air pump when the pressure of the
atmosphere is taken off. But we know that the evaporation
takes place when a drop of the fluid continues and bubbles with
bubbles and it is raised up by the air.

"Some say it arises from the heat of the sun, requiring
an increase of the heat to bring about evaporation.
But this cannot be the case for then the vapor would be
elastic. But we know that simultaneous vapor is perfectly
inelastic.

"Some say it arises from the heat of the sun, requiring
an increase of the heat to bring about evaporation.
But this cannot be the case for then the vapor would be
elastic. But we know that simultaneous vapor is perfectly
inelastic.

Handwritten text in a narrow column on the left side of the page, likely a marginal note or a list. The text is written in a cursive script and is mostly illegible due to the image quality.

Main body of handwritten text on the page, consisting of several paragraphs. The text is written in a cursive script and is mostly illegible due to the image quality.

Handwritten text on the right side of the page, likely a marginal note or a list. The text is written in a cursive script and is mostly illegible due to the image quality.

In many respects, however, the analogy between evaporation and solution is imperfect. In the case of solution, the solvent is increased by the addition of more solvent, and the solution is increased by the addition of more solute. In the case of evaporation, the solvent is increased by the addition of more solvent, and the solution is increased by the addition of more solute. This is also observed in evaporation, but is much promoted by the agitation of the air.

Evaporation can be carried on in an exhausted receiver quicker than out of it and the more rapidly the air is exhausted, the more rapid is the evaporation. It is also observed that the evaporation of water is much more rapid in a vacuum than in the air. This is also observed in the evaporation of other liquids. The evaporation of water is much more rapid in a vacuum than in the air. This is also observed in the evaporation of other liquids. The evaporation of water is much more rapid in a vacuum than in the air. This is also observed in the evaporation of other liquids.

It is now fully established that rain is always generated by ~~evaporation~~ evaporation. This doctrine was first taught by Mr. Hare and enlarged upon by Mr. Richman of Petersburg. It is now the first who by many conclusive experiments has fully ascertained the matter.

This image shows a blank, aged, light brown page, likely an endpaper or flyleaf of a book. The paper has a textured, slightly mottled appearance with numerous small dark spots (foxing) and larger stains, particularly along the right edge and bottom. The color is a warm, yellowish-brown, characteristic of old paper. There is no text or other markings on the page.

[illegible][illegible]

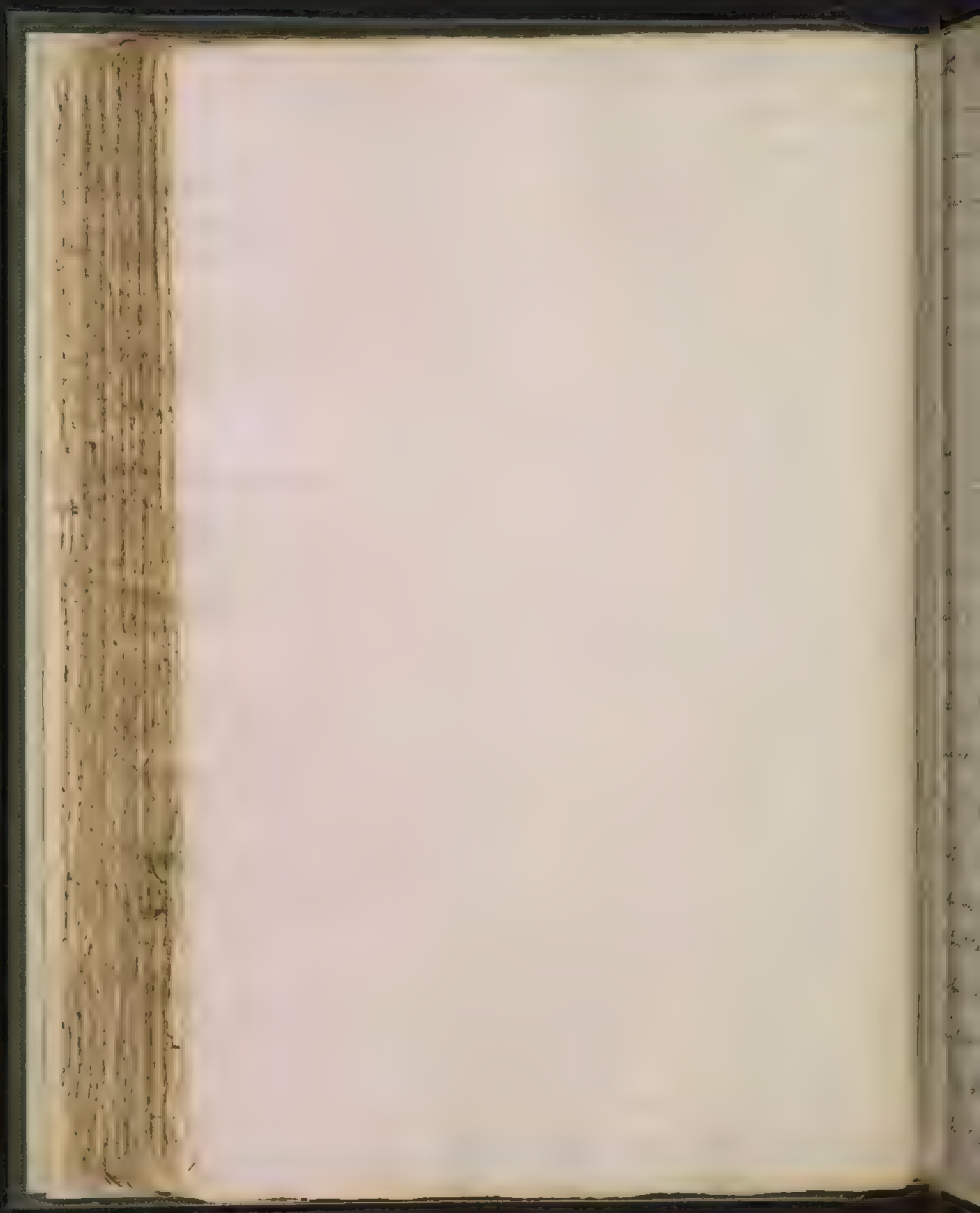
The seed produced by waterworn is of great value
in many places in the warm eastern countries especially
in the mountains of India China Persia and Egypt
where it is employed for an ointment or as a direct wood
burning. They contain a transude which by the evapora-
tion the contained liquor is gradually exhaled. These
are then covered with red earth in honor of their god Lamas
The Houeie had a cup of this kind which was given to
him by a Physician who lived 20 years amongst the
people

Handwritten text in a narrow column on the left side of the page, likely bleed-through from the reverse side. The text is written in a cursive script and is mostly illegible due to fading and the narrowness of the column.

The main body of the page is blank, showing only the texture and color of the aged paper.

Handwritten text visible on the right edge of the page, likely from the adjacent page. The text is written in a cursive script and is mostly illegible due to the edge of the page and fading.

[illegible]



health and we have seen several long periods
winter and summer and even months passed by
these means is always, observed in a degree, but
and the old people the reformation is always, for and the

1871

1870

[Faint handwritten notes at the bottom of the page]

[Faint handwritten notes]

whose acuteness ^{is} there is than persons whose organs of vision

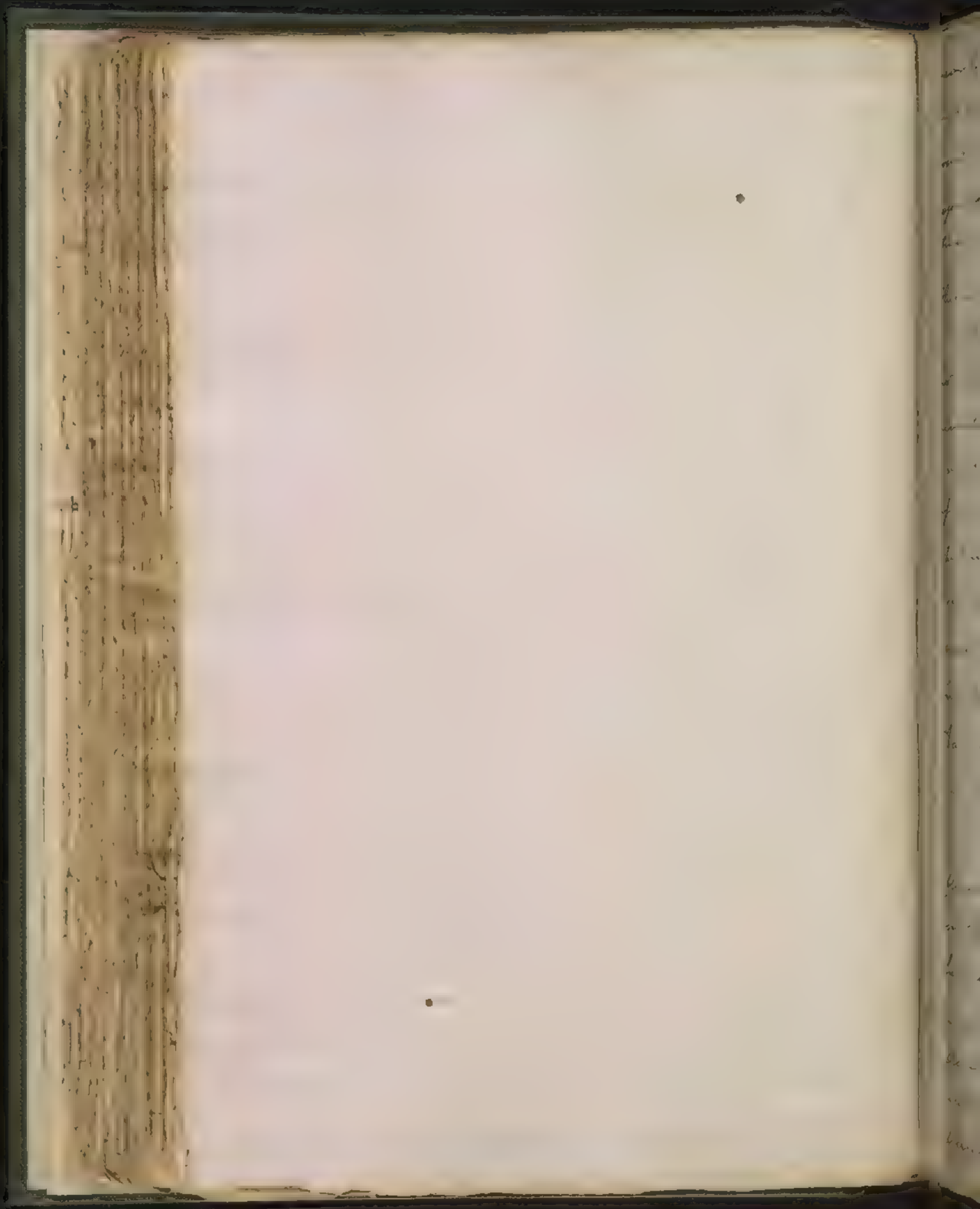
There is no doubt that the first of these is the most important in the series, and that the second is the most important in the series.

These burning woods but this is false. Woods may be over-
dried wither even after ignition. —————

... ..
... ..
... ..
... ..

to 4040° in a mass of 600° and
to 4000° and we saw the boiling point of mercury





is nearly the same with that of the former. This confirms
the truth of the former observation, as we know that
the point at which it becomes quite ...
are expected that the state will not become any other other
uniting. This is inferred from a comparison of the
... is not in our case.

The body is a tube that may be inserted
 and not ignited; the cap is inserted & confined
 & the vessel from vapor. Then a flame may be ignited
 with moderate degree of heat if the vapor is confined. Water
 in a perfect digester may be made so hot as to boil with
 the heat is not but a few degrees more in the point of boiling
 & similar. The vapor of an alcohol when inserted
 & the vessel is not ignited; the cap is inserted & confined
 & the vessel is thus ignited.

Flamingo is considered the general effects of heat
upon the body upon those of which there is still very much to be learned.

[illegible]

inflammation is confined to one edge of the thick
margin there is less inflammation. The effects, however,
are less extensive than on the other side in the following

1. Incommensurable bodies, neither a demonstration change or demonstration of this weight
2. Incommensurable, which is proven to be so from slight

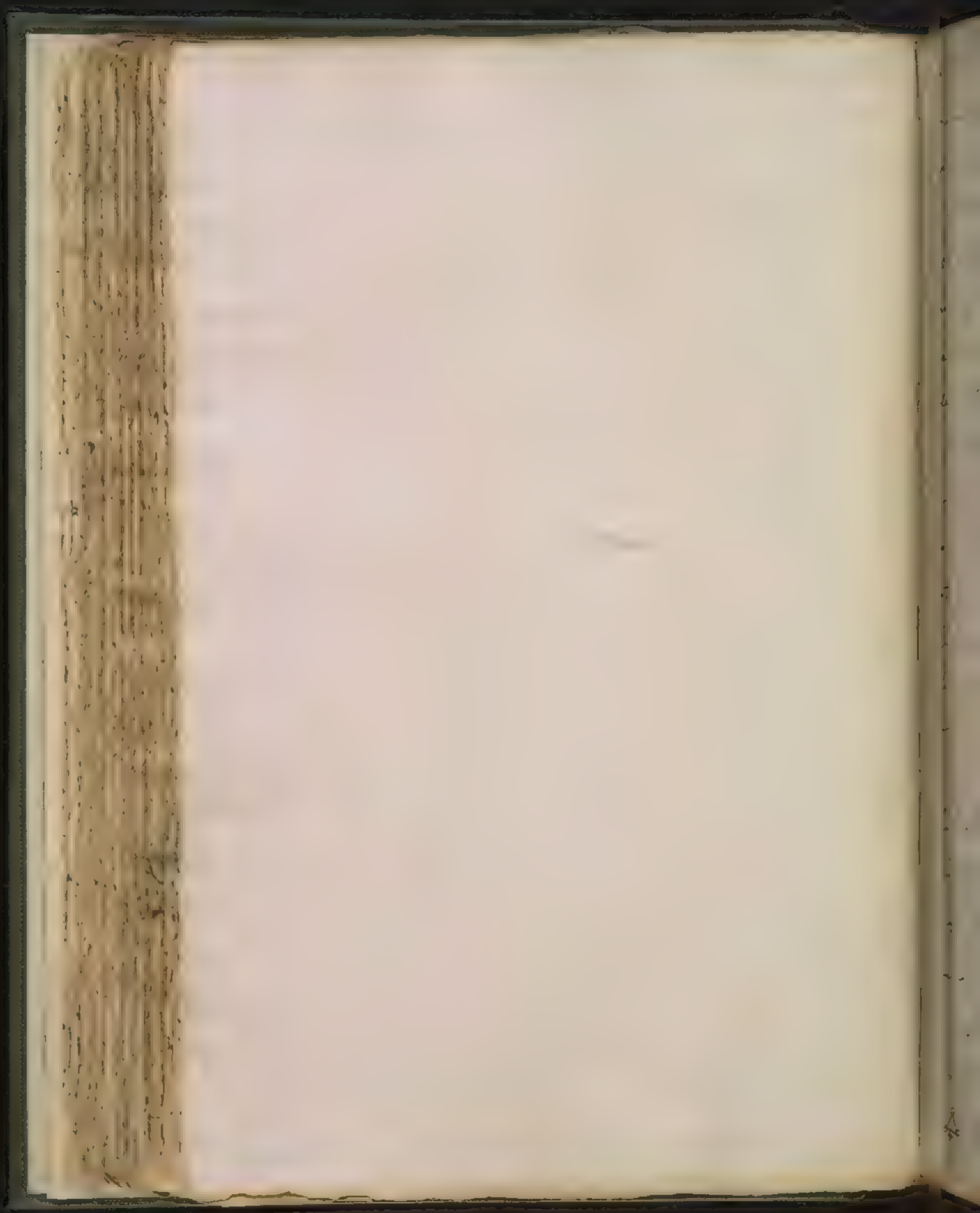
Handwritten text in a narrow column on the left side of the page, likely bleed-through from the reverse side. The text is written in a cursive script and is mostly illegible due to fading and blurring.

1. The first thing I noticed when I stepped
out of the plane was the cold air.

2. The second thing I noticed was the
silence. It was a strange silence, not the
quiet of a library, but the quiet of a
desert. The only sounds I could hear were
the hum of the plane's engines and the
rustle of my coat.

3. The third thing I noticed was the
view. The landscape below was a vast
expanse of flat, brown earth, stretching
out to the horizon. There were no trees,
no buildings, nothing but a sea of
desert. The sky above was a pale,
pale blue, with a few wispy clouds
scattered across it.

4. The fourth thing I noticed was the
heat. It was a strange heat, not the
warmth of a sunny day, but the
heat of a desert. The sun was high in
the sky, and the ground below was
scorching hot. I could feel the heat
radiating from the ground, and it was
a little uncomfortable.




[illegible]

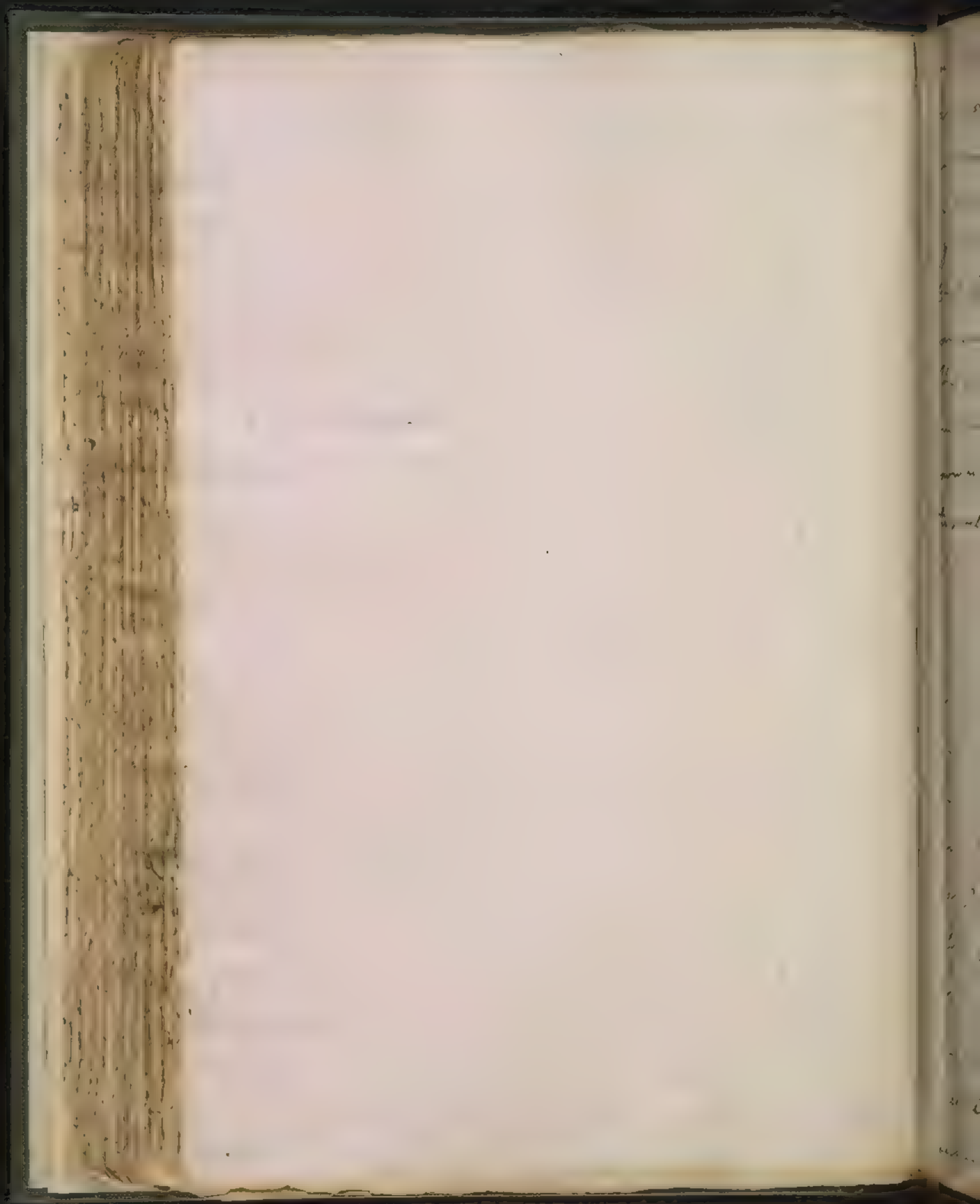
... ..
... ..
... ..

I have a very good one
 and a very good one in
 the same way.

with fasten on the wall. The wall is not
better in acid solution with the acid.

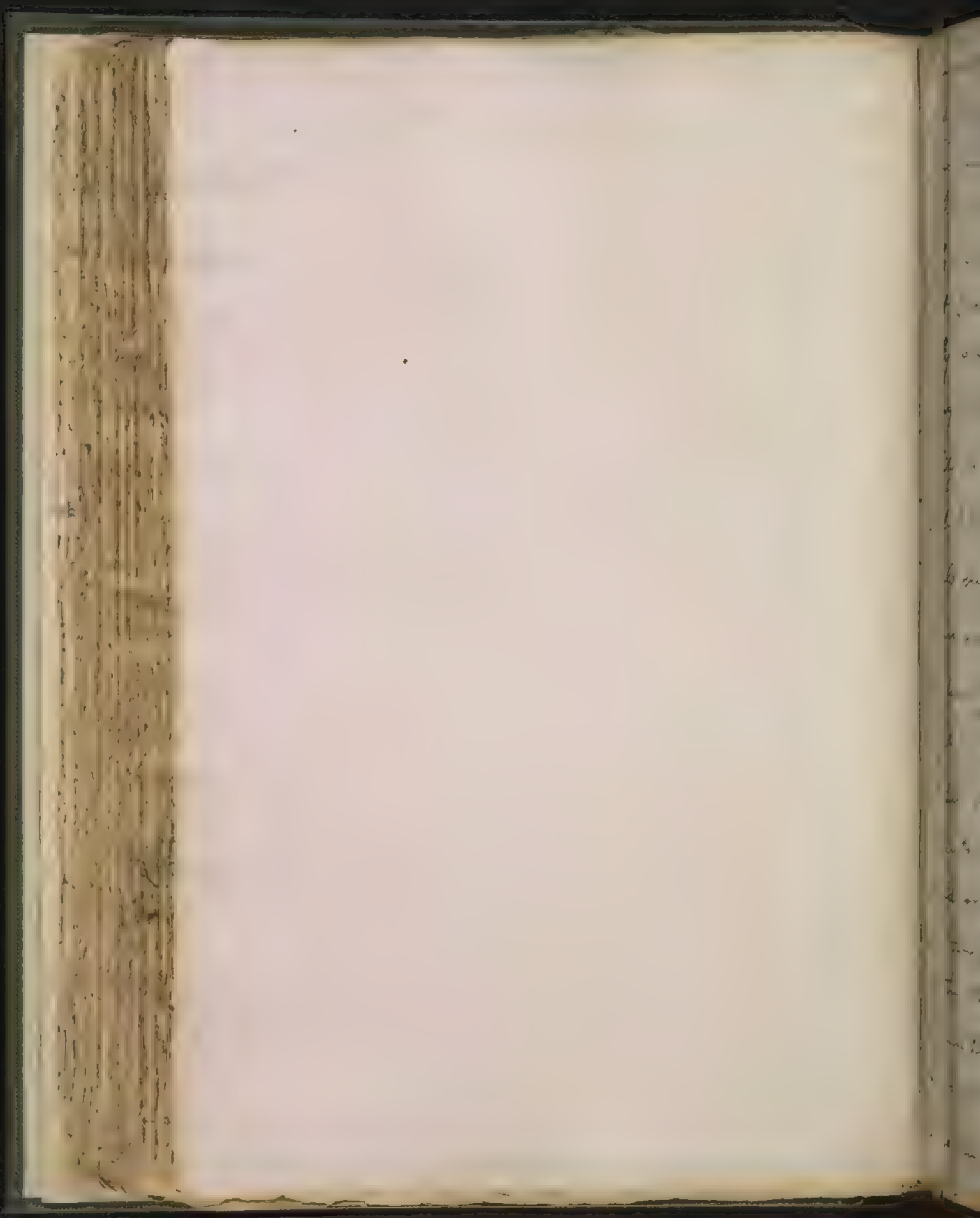
... it is a whole, and if we add any other ...
... in a ...  ...

(Δ) is a triangle with a cross inside it, representing a triangle with a cross inside it.



the swelling of the earth at the equator.

The results permit a more definite answer, especially
in cases where time, cost, etc., are factors.



The sun is the source of life and light
and is the great power which governs
the world.

It is the sun which gives us
the day and night of winter and summer. It is the sun which
gives us the seasons. It is the sun which gives us
the light of day and the darkness of night. It is the sun which
gives us the warmth of summer and the cold of winter. It is the sun which
gives us the life of the plants and the life of the animals. It is the sun which
gives us the light of the stars and the light of the moon. It is the sun which
gives us the life of the world and the life of the universe.

Plants would die and life on the earth would soon be extinguished. In a word the air and
the fluid would become a dense solid mass. On the other hand the earth would be greatly diminished
and the earth would approach so near the sun that the
sun would be in the air, once more we would see the
sun. The sun would be in the air and the air would be in the sun.

[Faint, illegible handwritten text in a narrow column on the left side of the page.]

[Large area of extremely faint, illegible handwritten text covering the main body of the page.]

[Faint, illegible handwritten text visible along the right edge of the page, likely from the adjacent page.]



[illegible]

[Faint, illegible handwritten text in a narrow column on the left side of the page.]

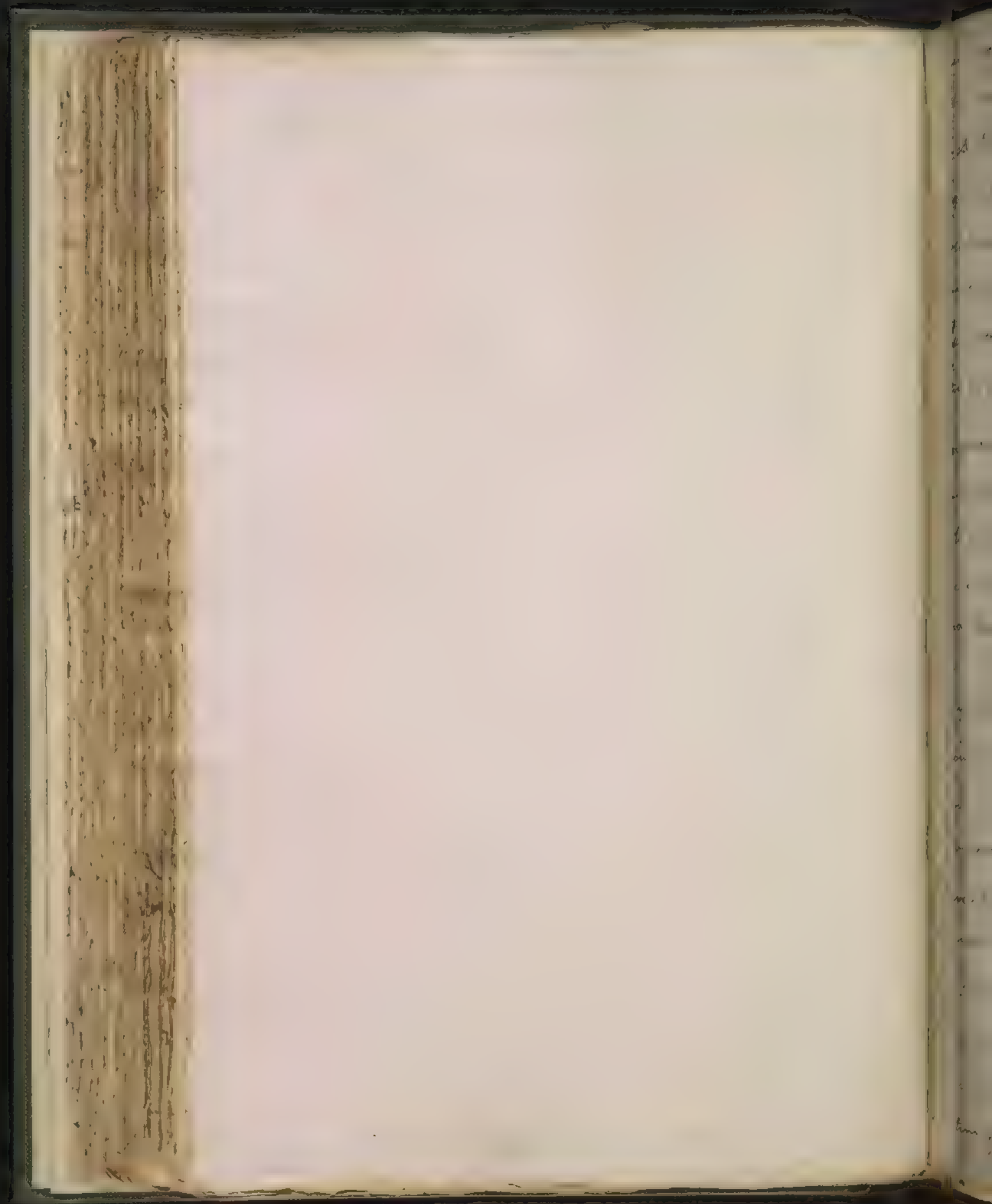
[Large area of extremely faint, illegible handwritten text covering the majority of the page.]

[Faint, illegible handwritten text visible along the right edge of the page.]

I have at home a few specimens of the same
 and will send you a few if you wish. I only
 have a few of the same at home. I only
 have a few of the same at home. I only
 have a few of the same at home. I only

[illegible][illegible]

This image shows a blank, aged, cream-colored page, likely an endpaper or flyleaf of a book. The paper has a textured appearance with various dark smudges, stains, and a vertical crease near the left edge. The binding edge on the left is visible, showing the inner structure of the book.



in various directions arranged in a regular
and it will then describe a form for the ice
mass that it appears to be in a small reduction
the quantity of water in the water

1st section is a vertical one of the ice is according
to the common method is, as follows.

1st section is a vertical one of the ice is according
to the common method is, as follows.

2nd section is a horizontal one of the ice is according
to the common method is, as follows.

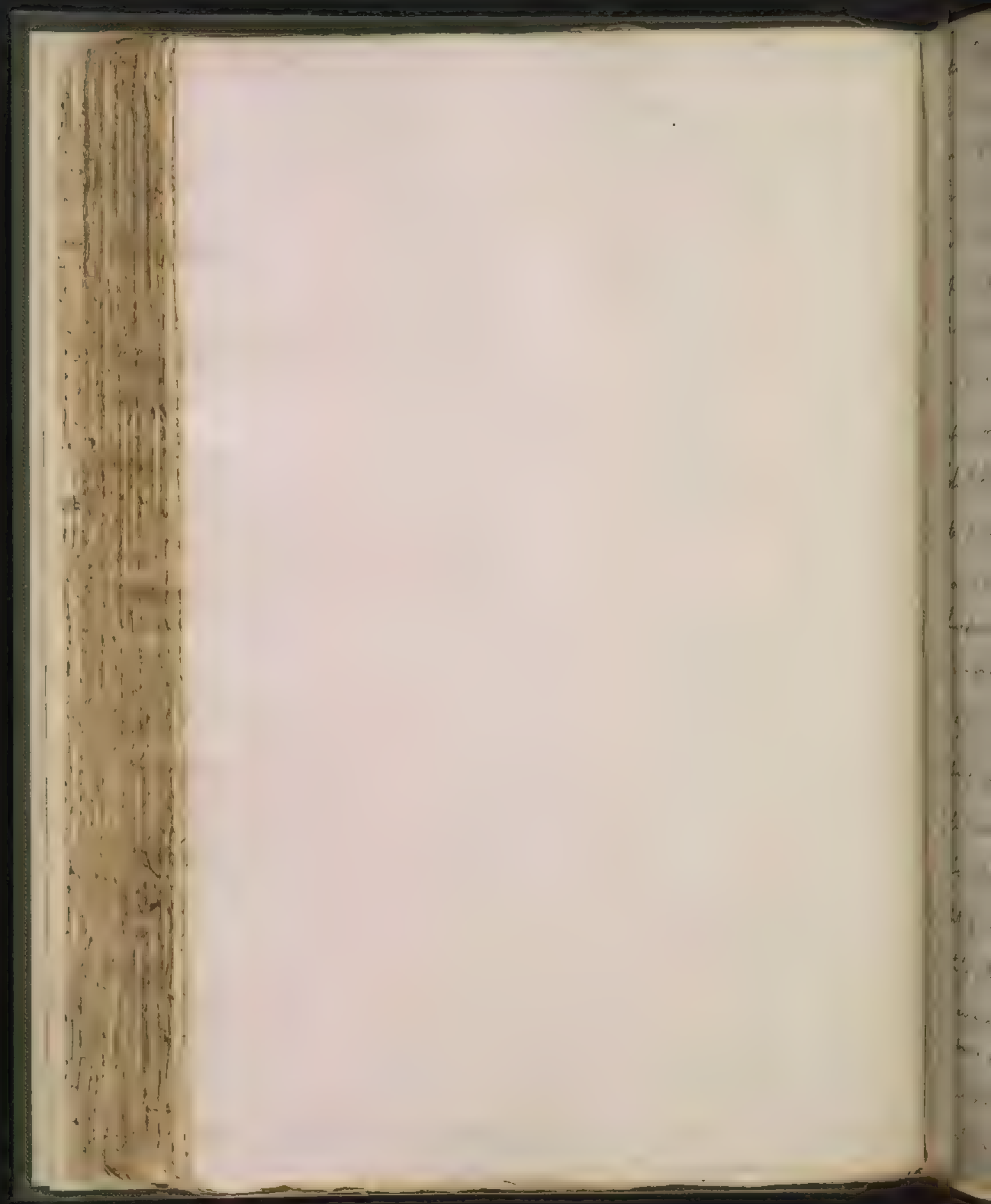
3rd section is a vertical one of the ice is according
to the common method is, as follows.

4th section is a horizontal one of the ice is according
to the common method is, as follows.

5th section is a vertical one of the ice is according
to the common method is, as follows.

6th section is a horizontal one of the ice is according
to the common method is, as follows.

7th section is a vertical one of the ice is according
to the common method is, as follows.



note (1) and in

... ..

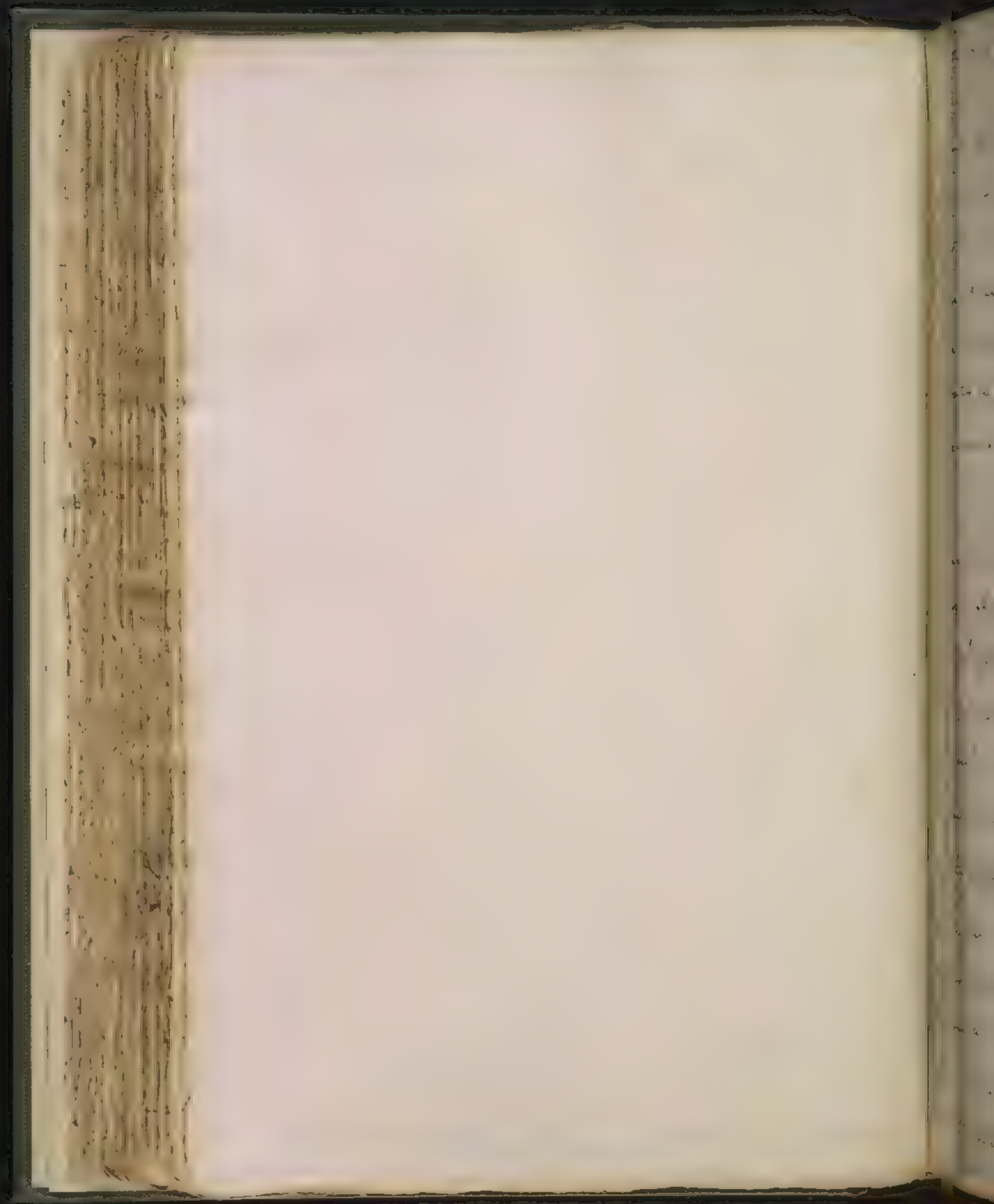
... ..

... .. in proportion to their sur-
faces. This is the way in which the quenching is carried
out, and
... .. quenching is carried out by a
... .. of the mechanism is applied
... ..

... ..
... ..
... ..
... .. they will remain

... ..
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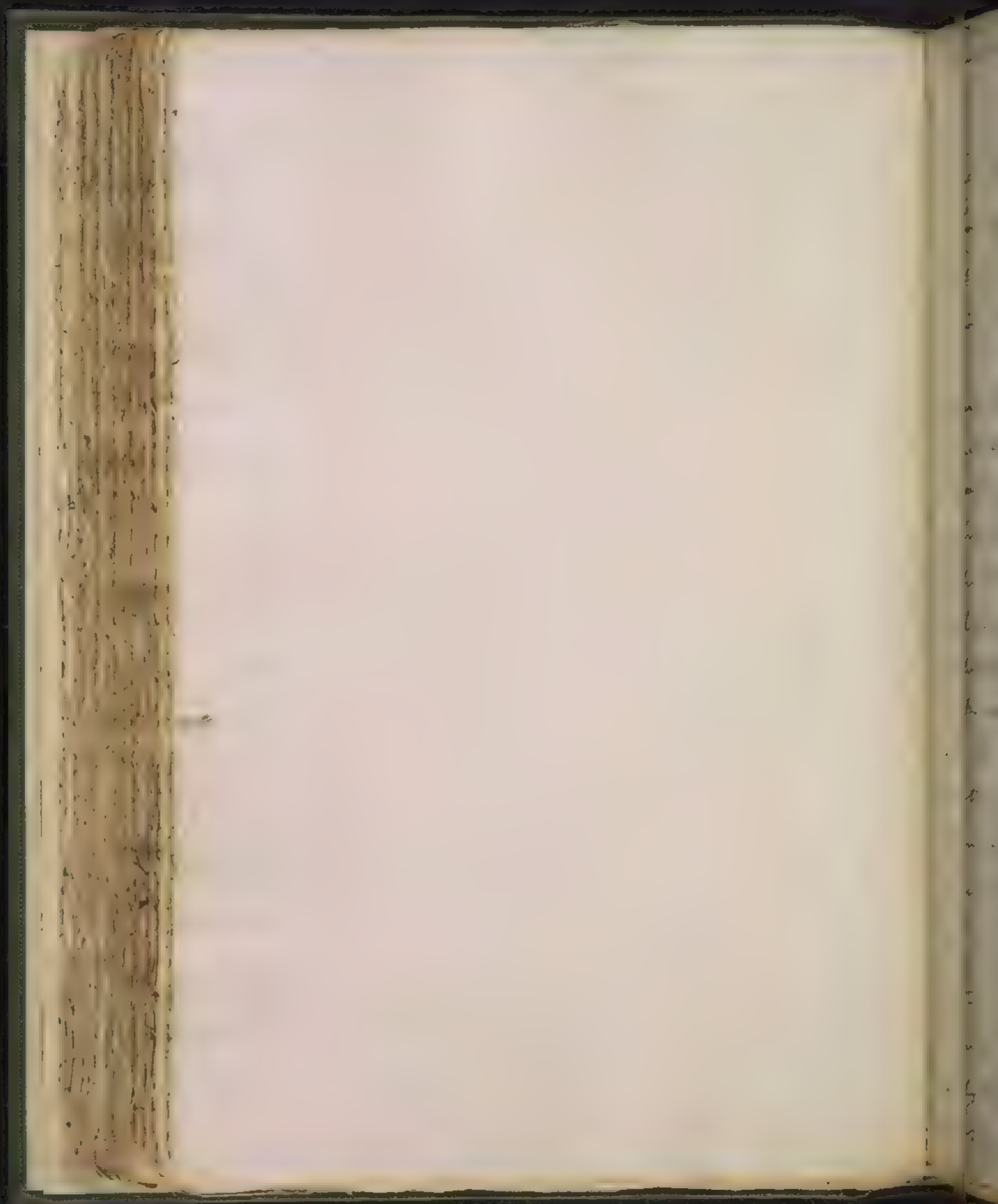
... ..
... ..
... ..
... ..
... ..



[illegible]

Lesson

[illegible]



and moved a line on the ...

by ... 1876

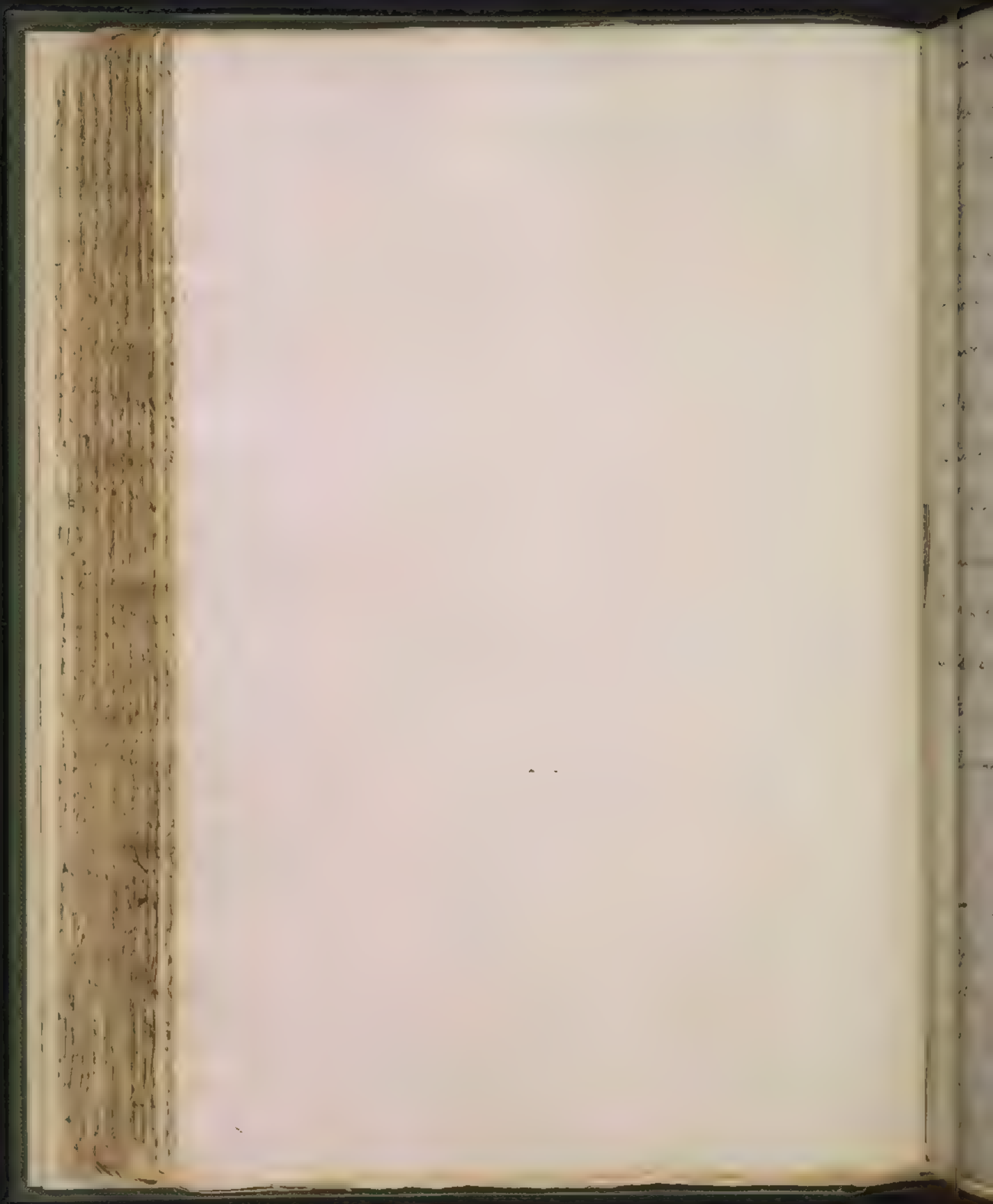
... in the ... and ...
... movement, ...
... on ...

... ..

... ..
... ..
... ..
... ..
... ..
... ..
... ..

... ..
with the
... ..
... ..
... ..
... ..

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... ..
... ..
... ..
... ..



in the vessels a
... ..

... ..

1. The instrument alone
... ..
the gold
... ..
... ..

4. If
... ..
... ..
... ..
... ..
... ..
... ..
... ..
... ..

... .. Purpose ...

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

blot



not yet in the hands of the public

the first edition of the book

is now

of the book

the first edition of the book

the first edition of the book

the first edition of the book

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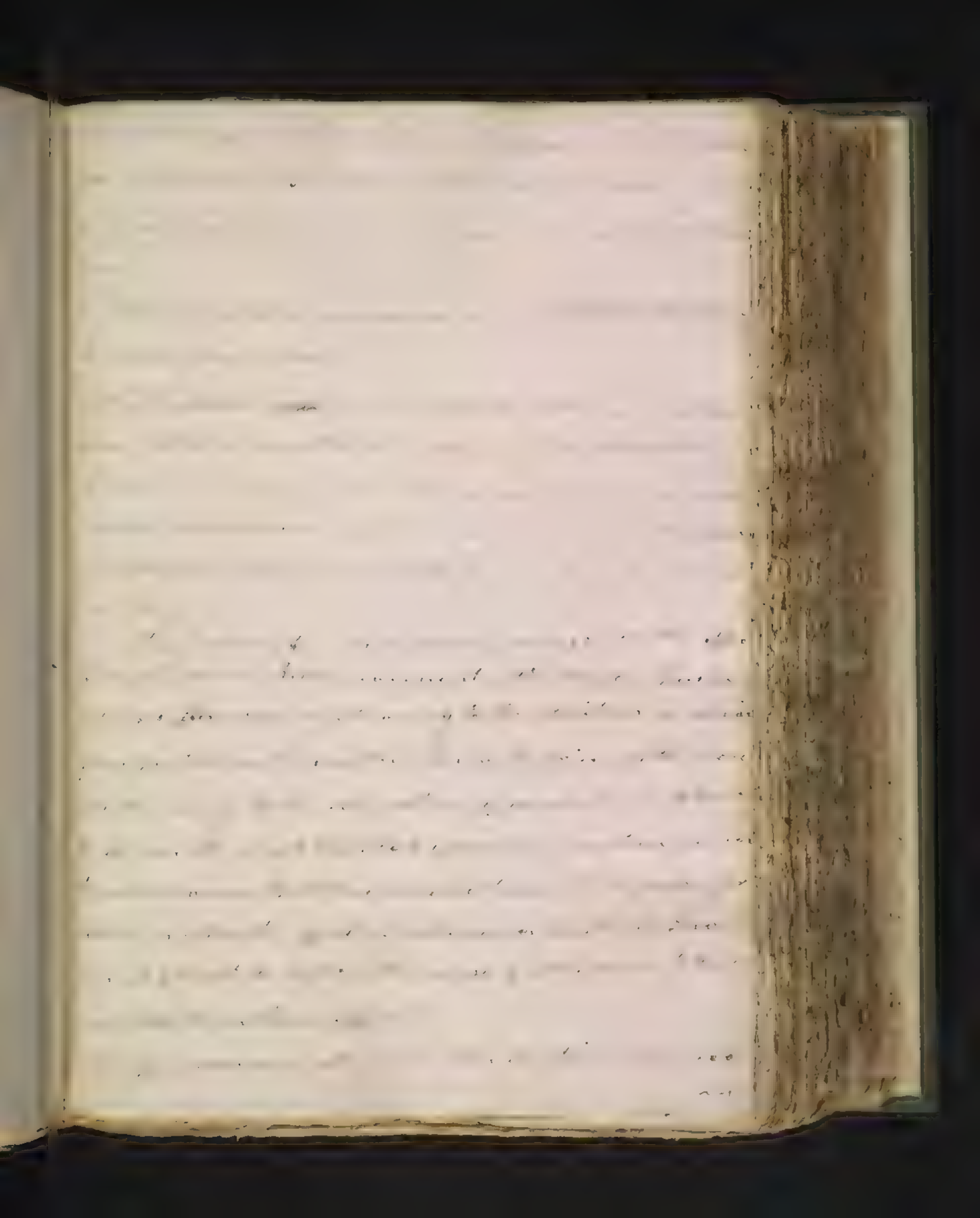
Handwritten text in a narrow column on the left side of the page, likely bleed-through from the reverse side. The text is written in a cursive script and is mostly illegible due to fading and blurring.

The main body of the page is blank, showing only the texture and color of the aged paper.

Handwritten text in a narrow column on the right side of the page, likely bleed-through from the reverse side. The text is written in a cursive script and is mostly illegible due to fading and blurring.

I have been thinking of you very much lately
 and wondering how you are getting on. I hope
 you are well and happy. I have been very busy
 lately but I have managed to find some time
 to write you. I have been thinking of you
 very much lately and wondering how you are
 getting on. I hope you are well and happy.
 I have been very busy lately but I have
 managed to find some time to write you.
 I have been thinking of you very much lately
 and wondering how you are getting on. I hope
 you are well and happy. I have been very busy
 lately but I have managed to find some time
 to write you. I have been thinking of you
 very much lately and wondering how you are
 getting on. I hope you are well and happy.
 I have been very busy lately but I have
 managed to find some time to write you.

[Faint, illegible handwritten text, likely bleed-through from the reverse side of the page.]



Handwritten text in a narrow column on the left side of the page, likely bleed-through from the reverse side. The text is written in a cursive script and is mostly illegible due to fading and the narrowness of the column.

no more a little of the same

at the same time

the same

the same

the same

the same

the same

the same

the same

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the same

the same

the same

the same

the same

the same

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the same

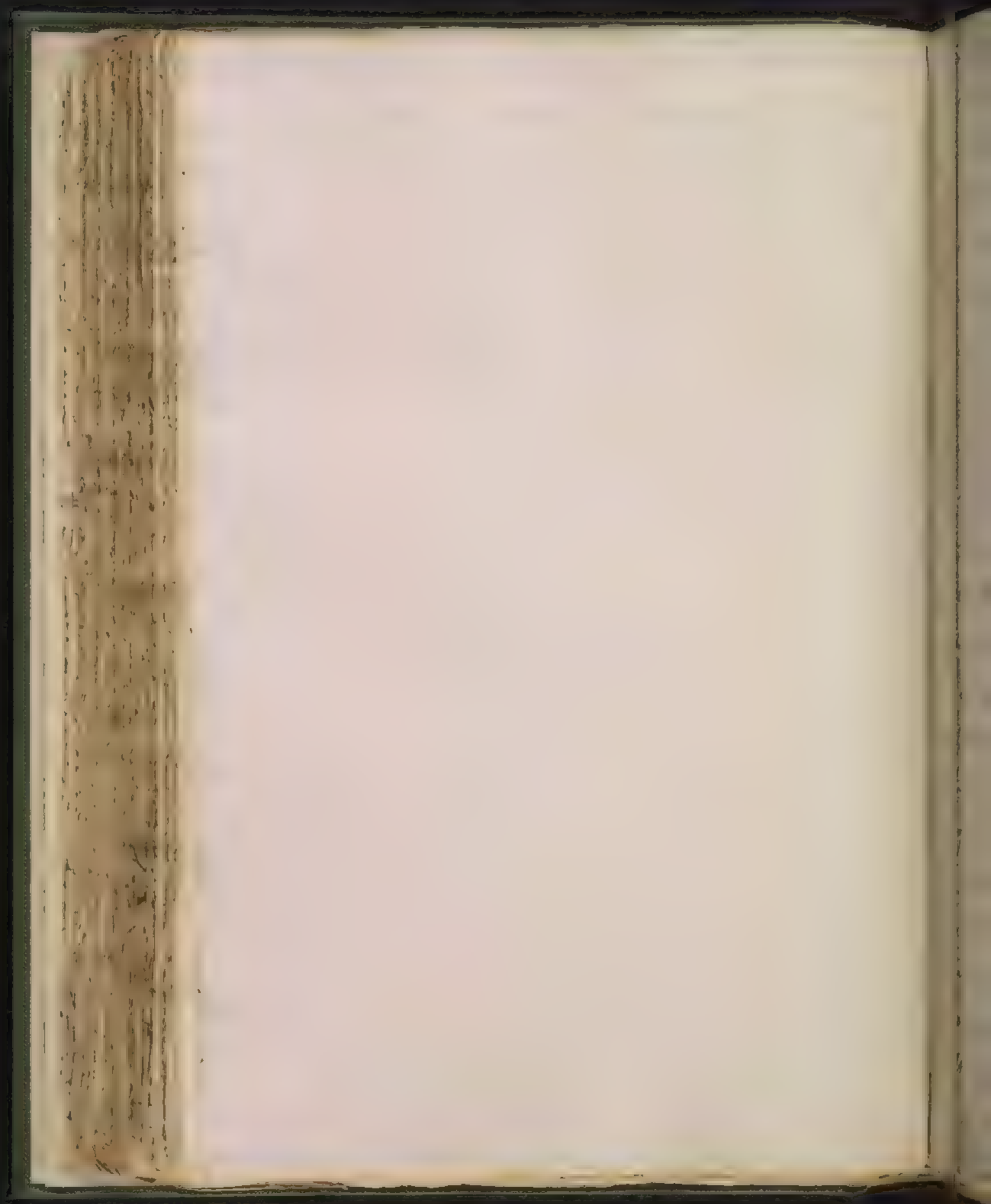
the same

the same

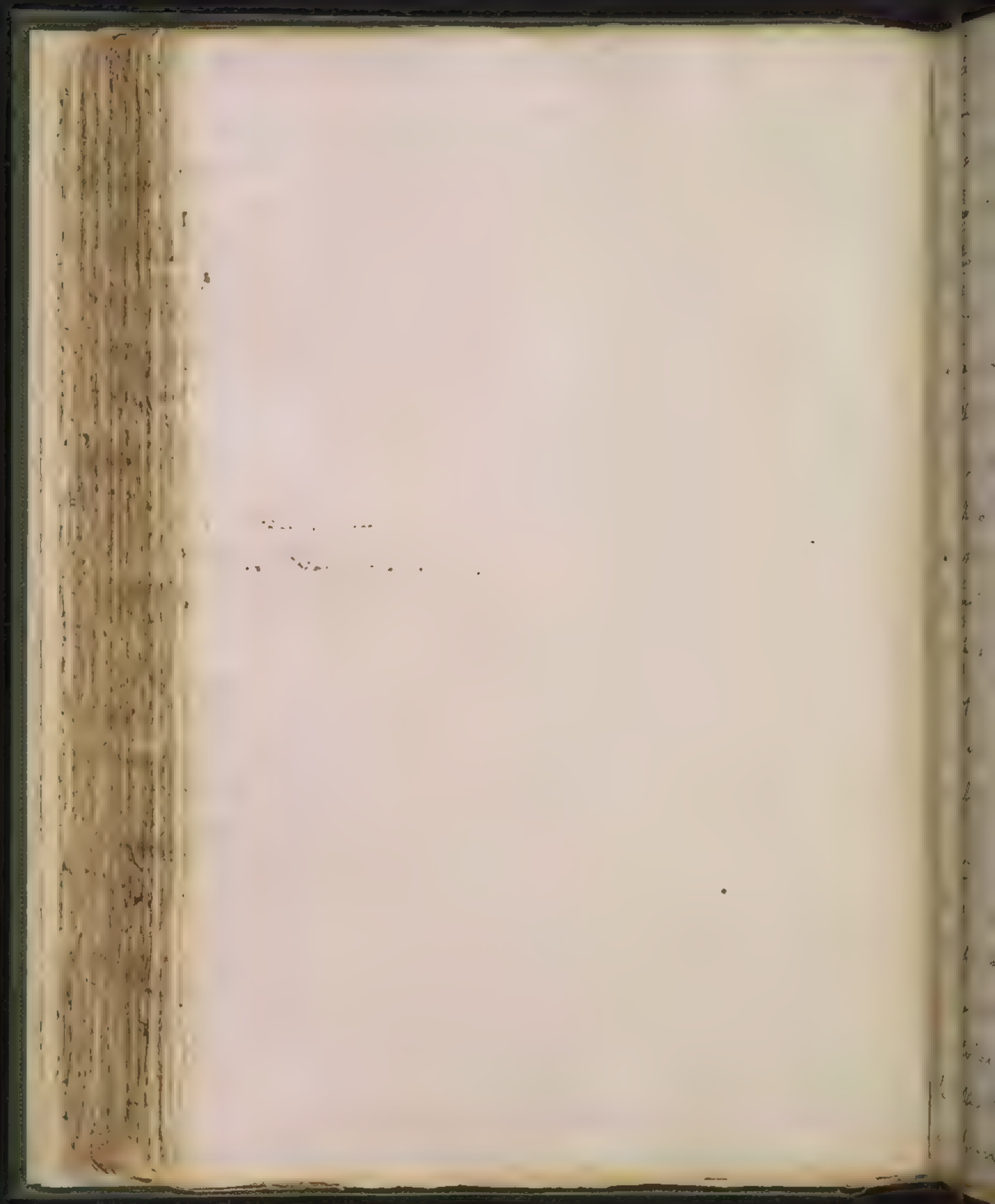
the same

the same

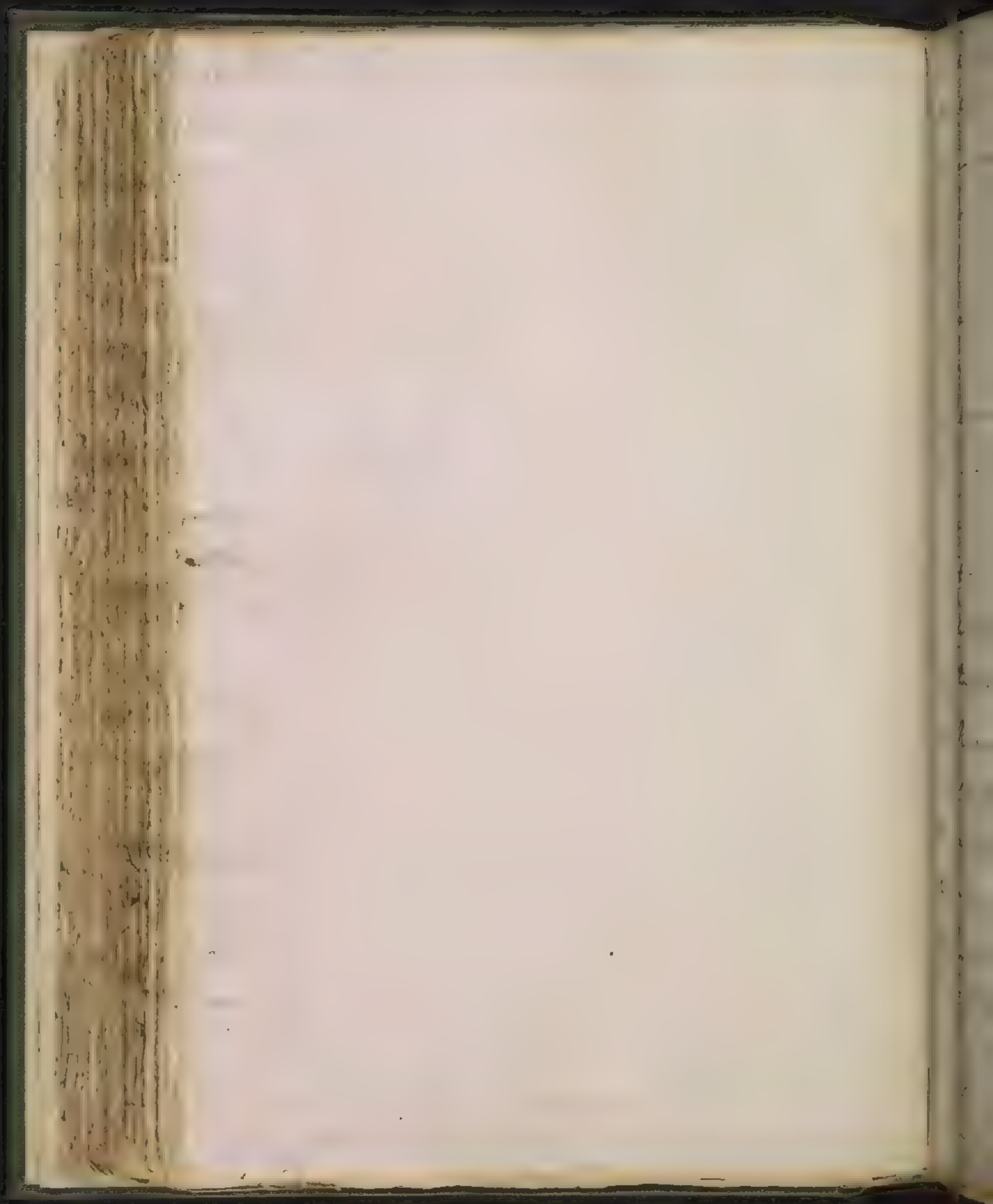
the same

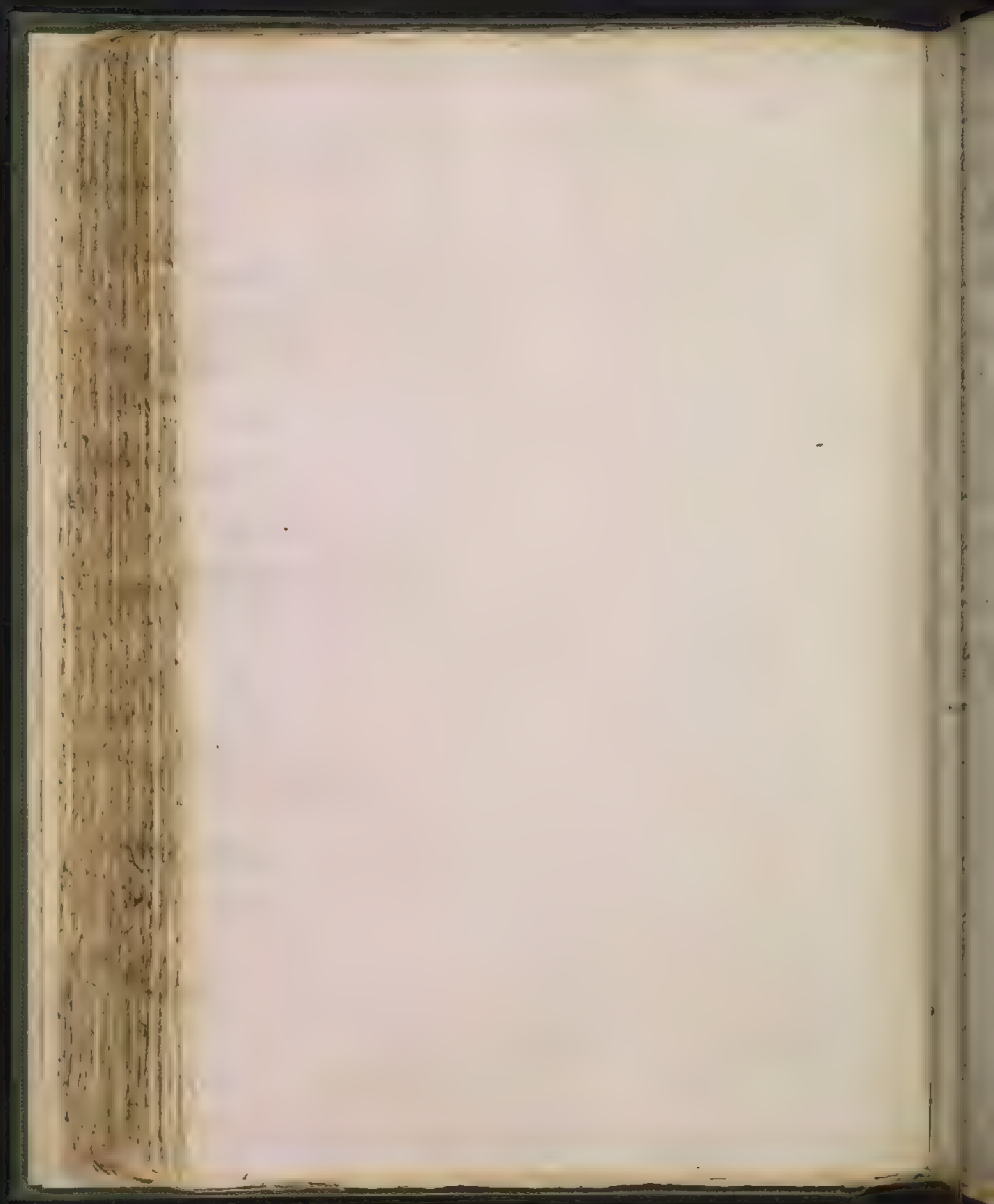


The first of these is the fact that the
 human mind is not a blank slate, but
 is filled with a vast amount of
 information from birth. This information
 is not only from the senses, but also
 from the imagination. The human
 mind is a complex of many different
 parts, each of which has its own
 function. The brain is the central
 organ of the mind, and it is the
 seat of all our thoughts and feelings.
 The heart is the organ of life, and
 it is the source of all our emotions.
 The lungs are the organs of respiration,
 and they are the source of all our
 breath. The stomach is the organ of
 digestion, and it is the source of all
 our food. The liver is the organ of
 excretion, and it is the source of all
 our waste. The kidneys are the organs
 of filtration, and they are the source
 of all our urine. The bladder is the
 organ of storage, and it is the source
 of all our urine. The rectum is the
 organ of elimination, and it is the
 source of all our feces. The anus is
 the organ of exit, and it is the source
 of all our waste. The human body
 is a complex of many different parts,
 each of which has its own function.
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 thoughts and feelings. The heart is the
 organ of life, and it is the source of
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 source of all our breath. The stomach
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 organ of excretion, and it is the source
 of all our waste. The kidneys are the
 organs of filtration, and they are the
 source of all our urine. The bladder
 is the organ of storage, and it is the
 source of all our urine. The rectum is
 the organ of elimination, and it is the
 source of all our feces. The anus is
 the organ of exit, and it is the source
 of all our waste.



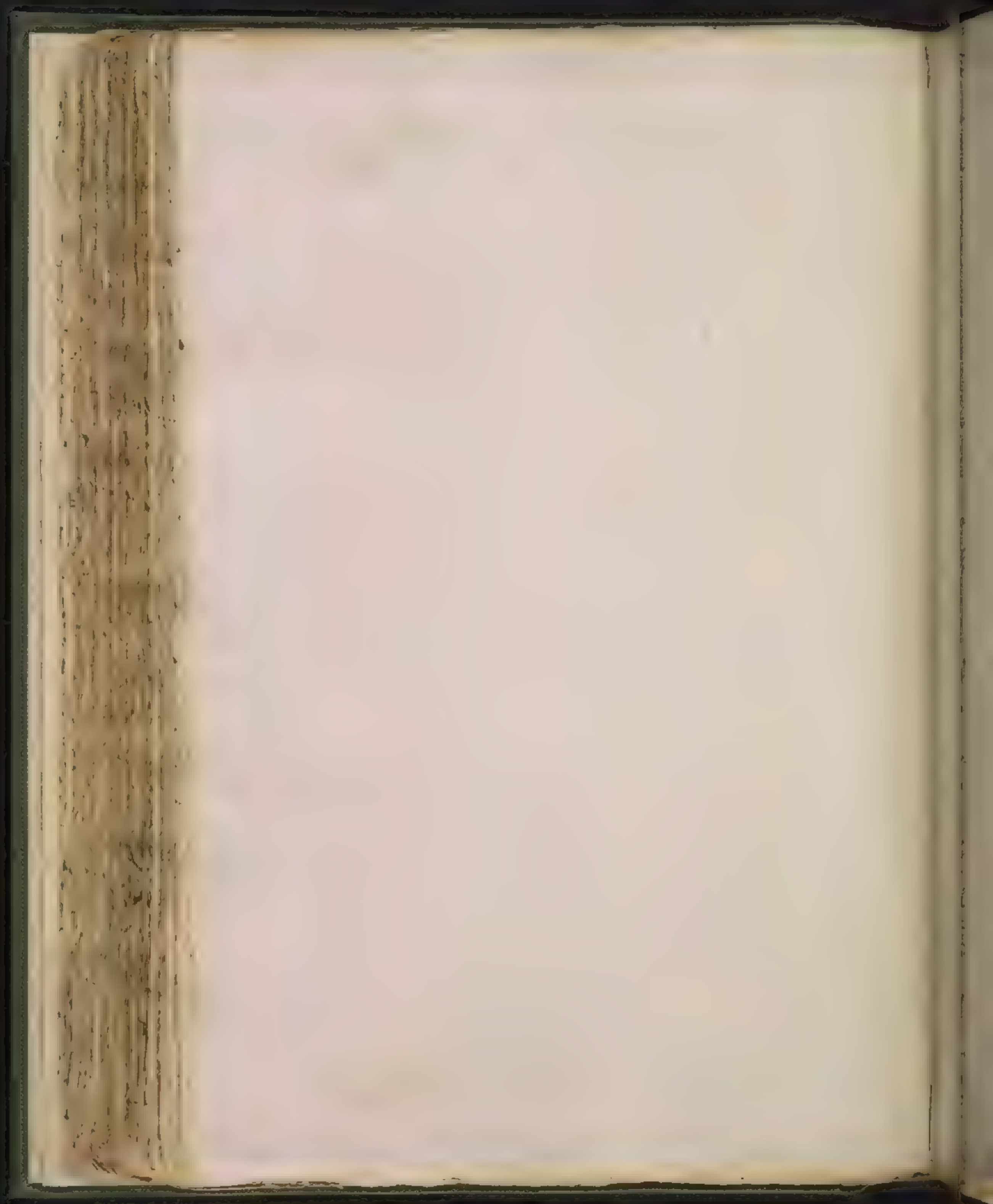
[illegible][illegible][illegible][illegible][illegible][illegible]

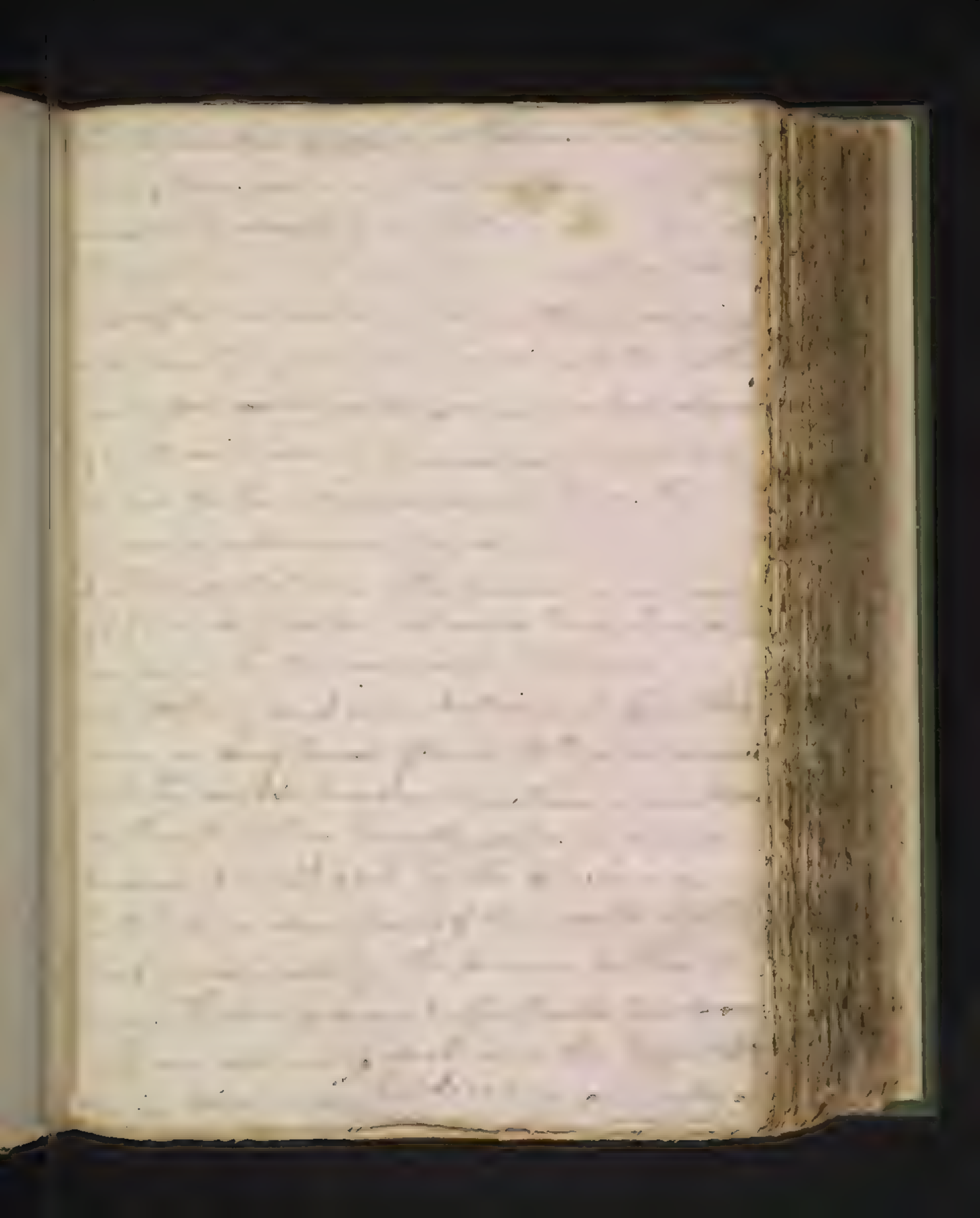


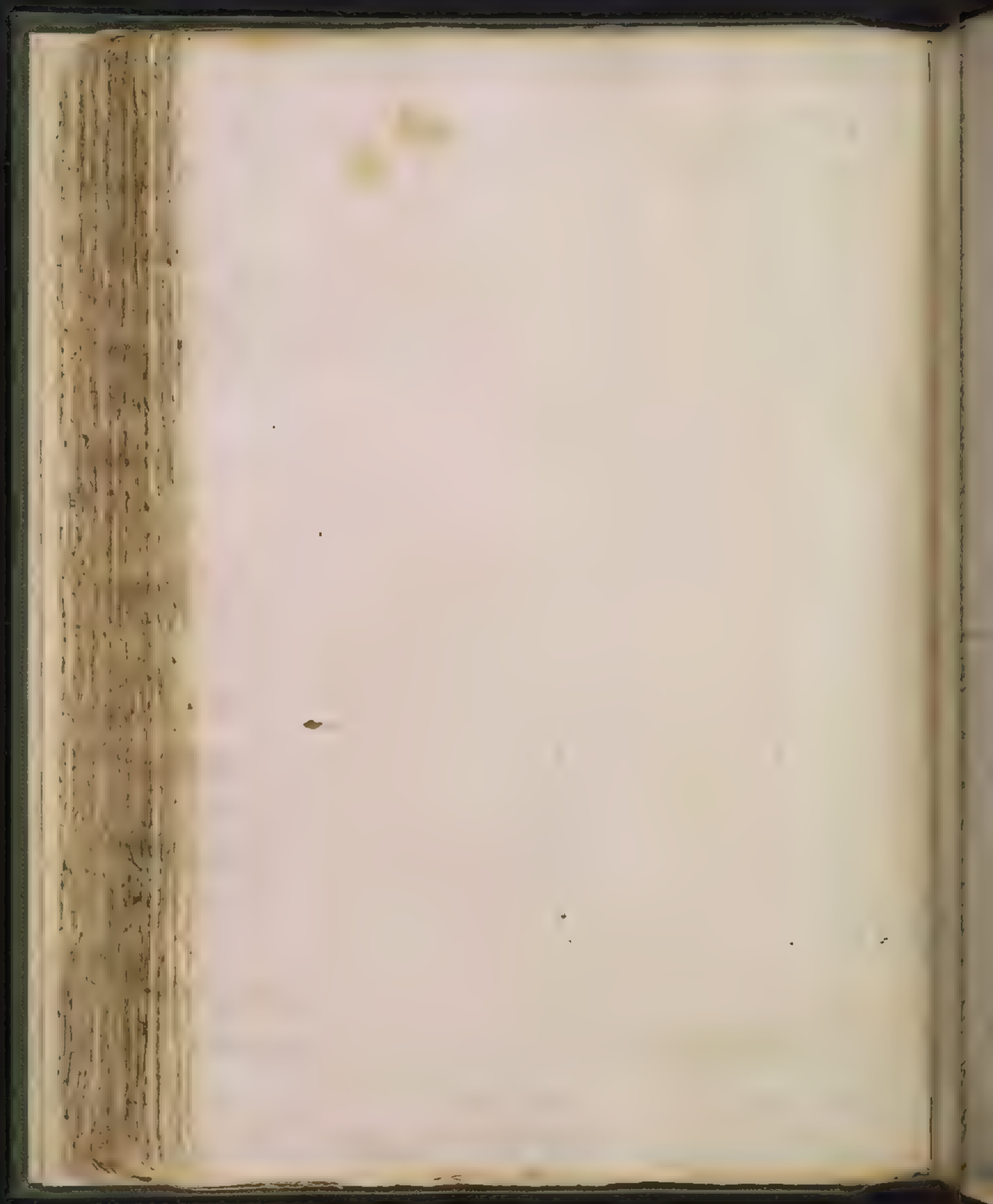


or such a great number of them, which
are common, and are the result of a cold
in the general system, the operation of producing
such a result is not a new one, and is not a
new discovery. It means of applying a regular
system.

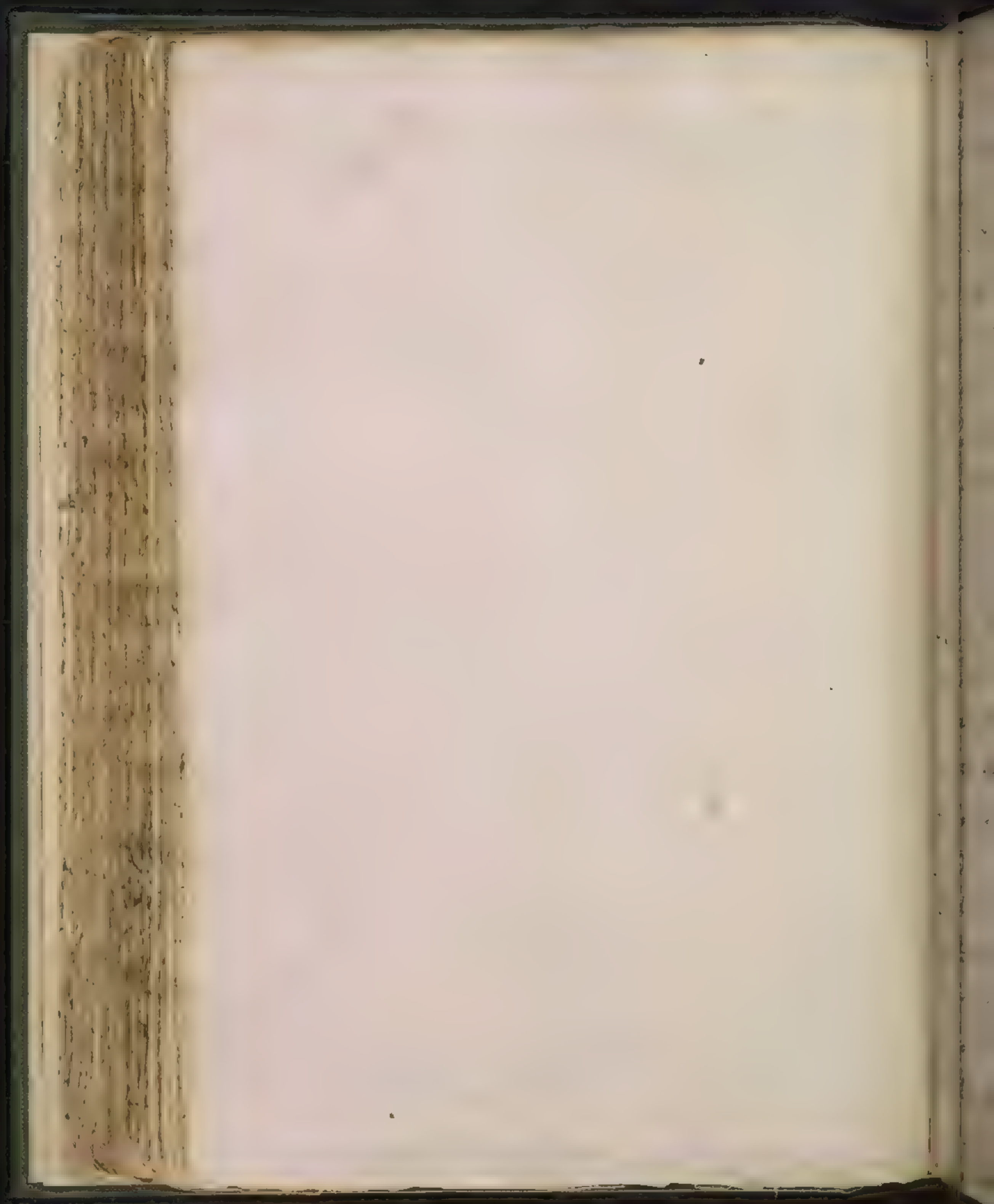
1. If the operation for, various, and
the means of producing a result, is
not a new one, and is not a new
discovery, and seasons of the year is best, and for
producing the result. It is only a good for
producing.







[Faint handwritten notes]



He is a very good man, but I have never

known him.

He is a very good man, but I have never

known him.

He is a very good man, but I have never

known him.

He is a very good man, but I have never

known him.

He is a very good man, but I have never

known him.

He is a very good man, but I have never

known him.

He is a very good man, but I have never

known him.

He is a very good man, but I have never

known him.

He is a very good man, but I have never

known him.

He is a very good man, but I have never

known him.

He is a very good man, but I have never

known him.

He is a very good man, but I have never

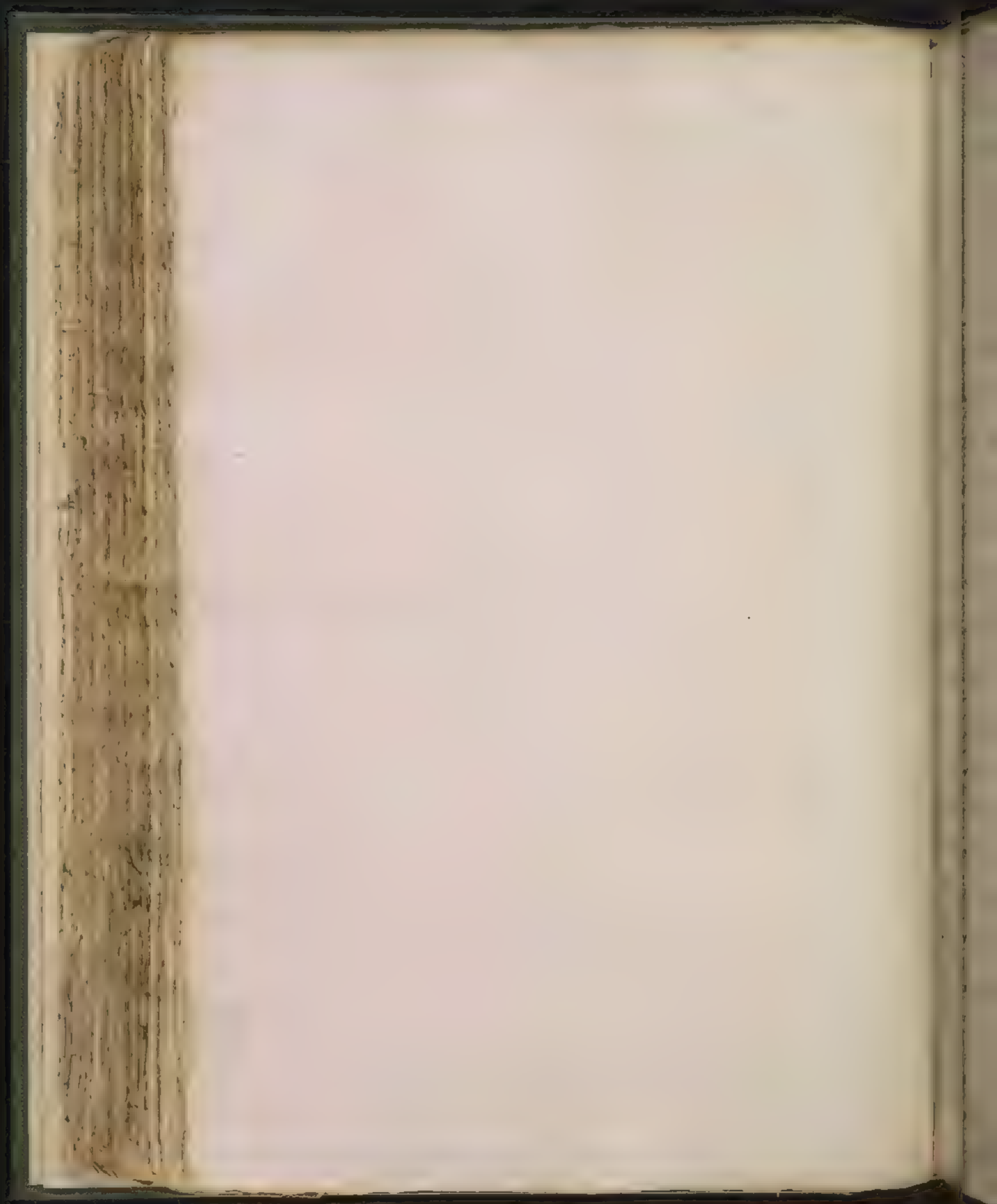
known him.

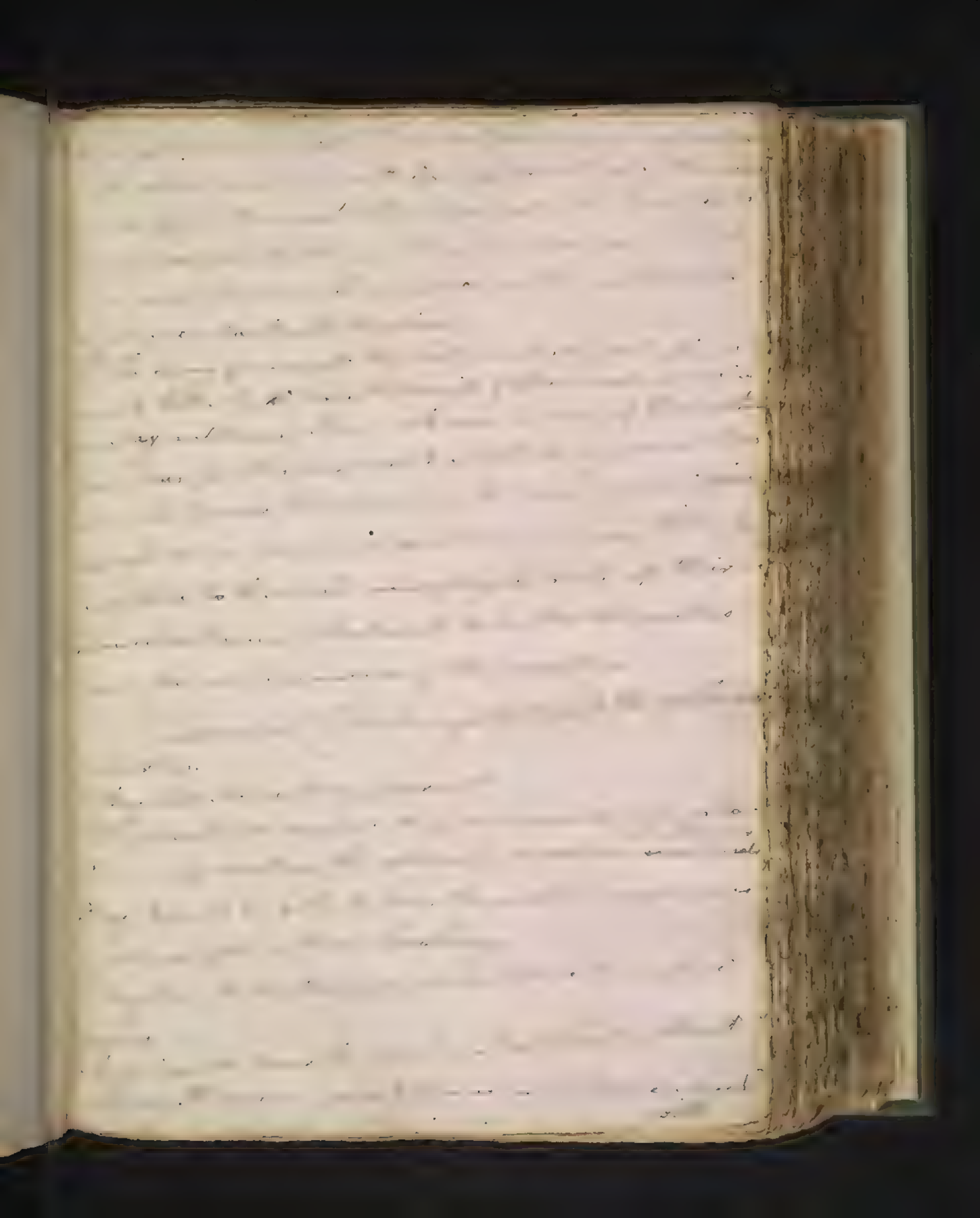
He is a very good man, but I have never

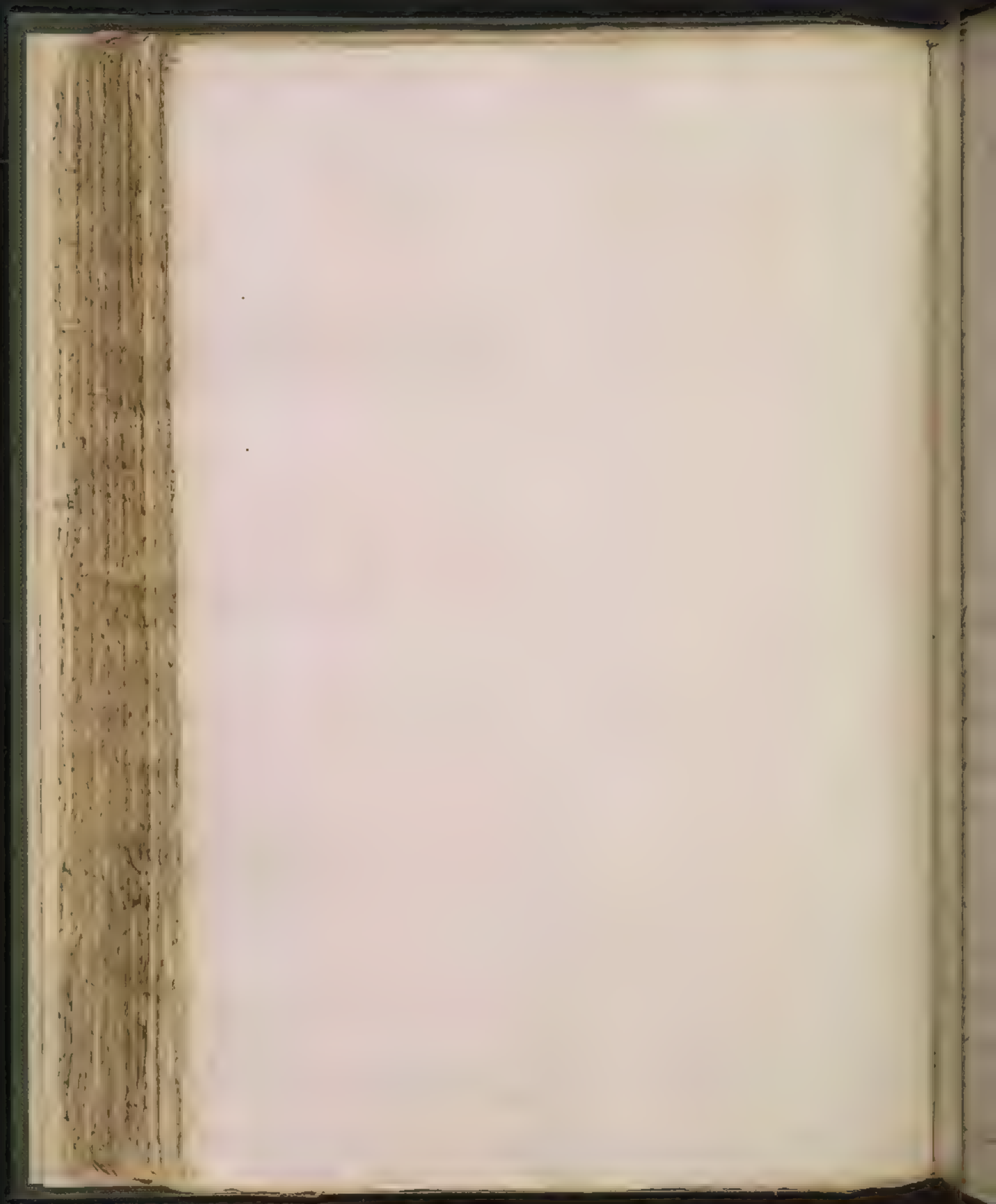
known him.

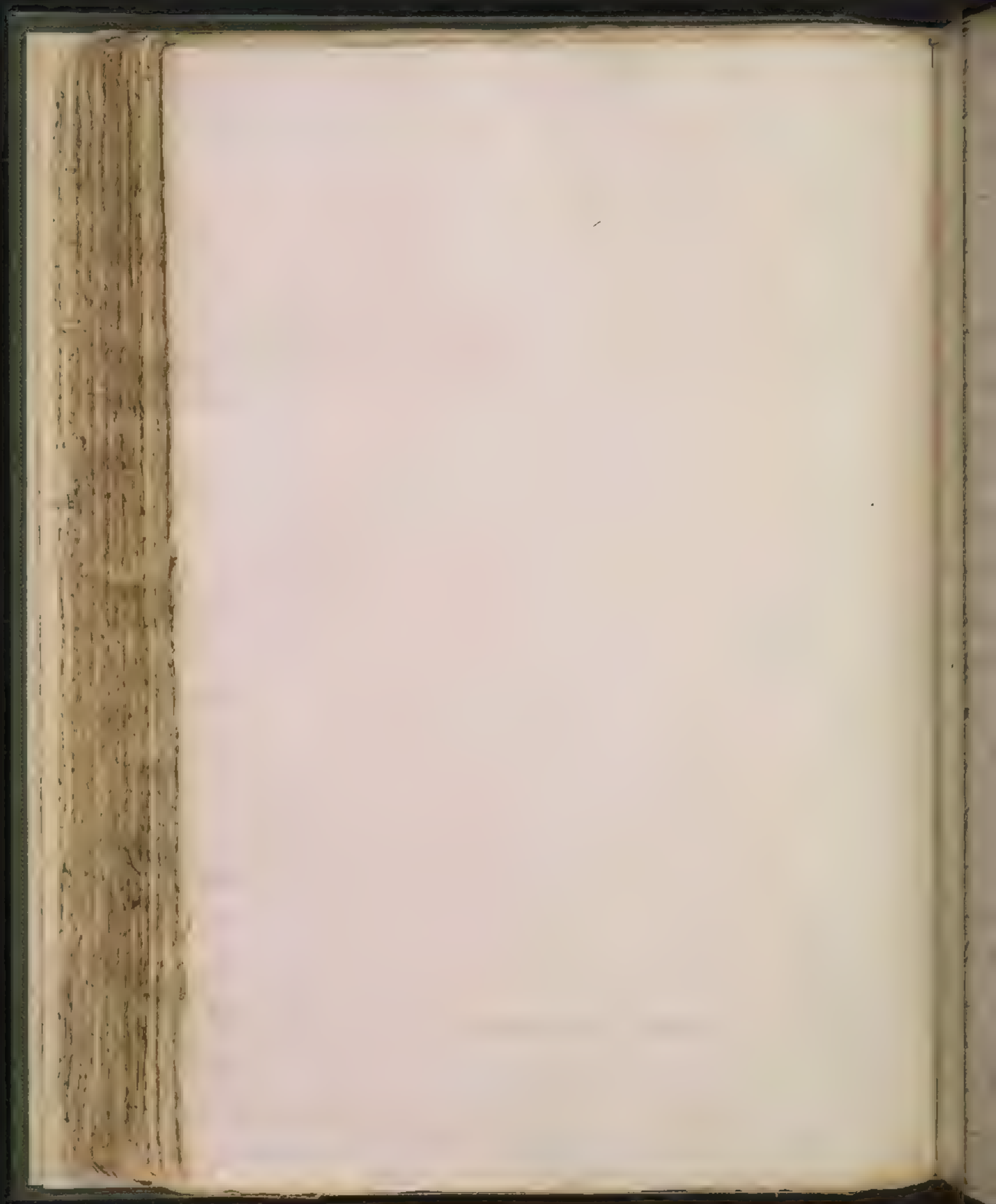
He is a very good man, but I have never

known him.

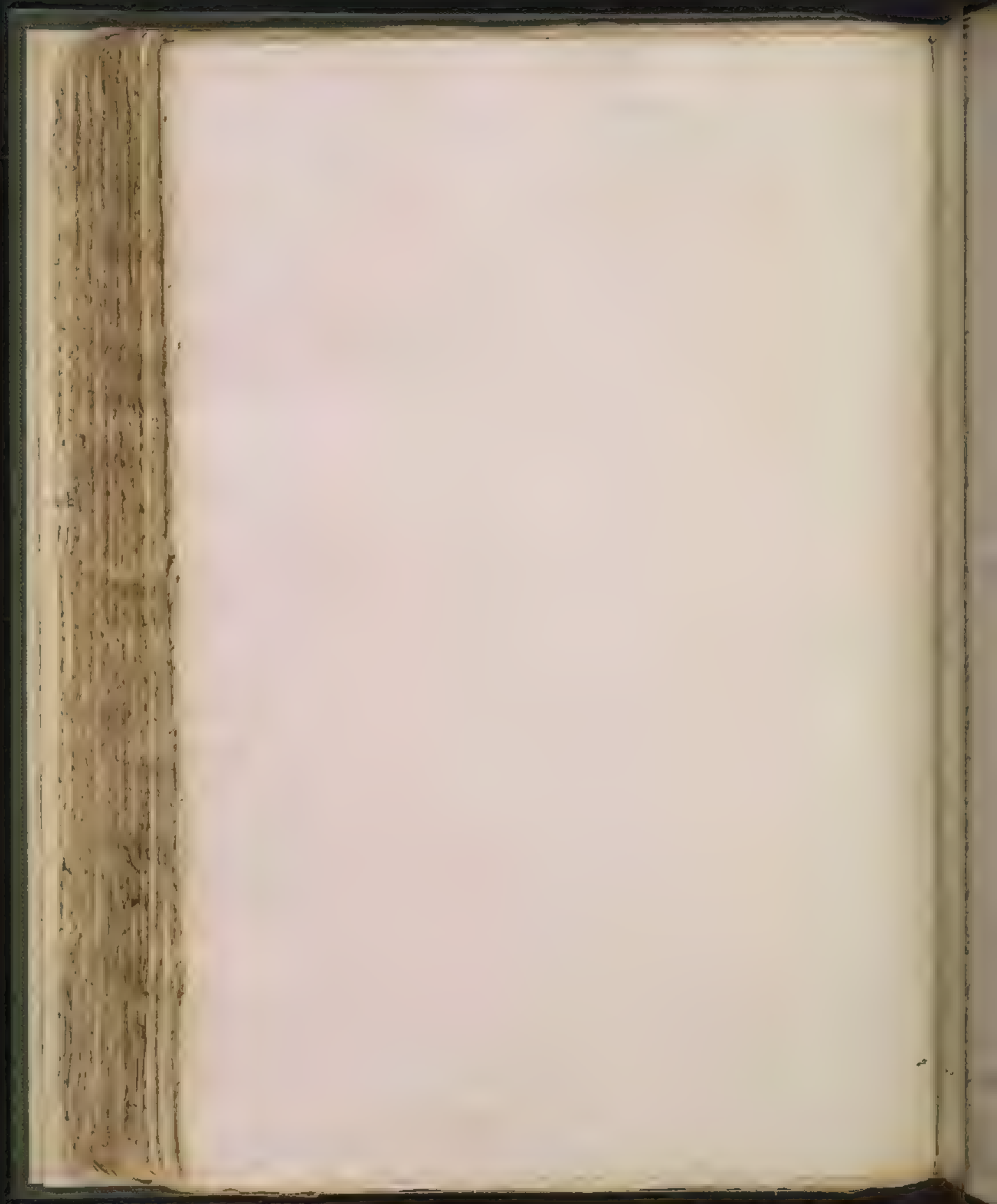








[illegible]



[Faint, mostly illegible handwritten text in cursive script, covering the upper and middle portions of the page.]

and time while

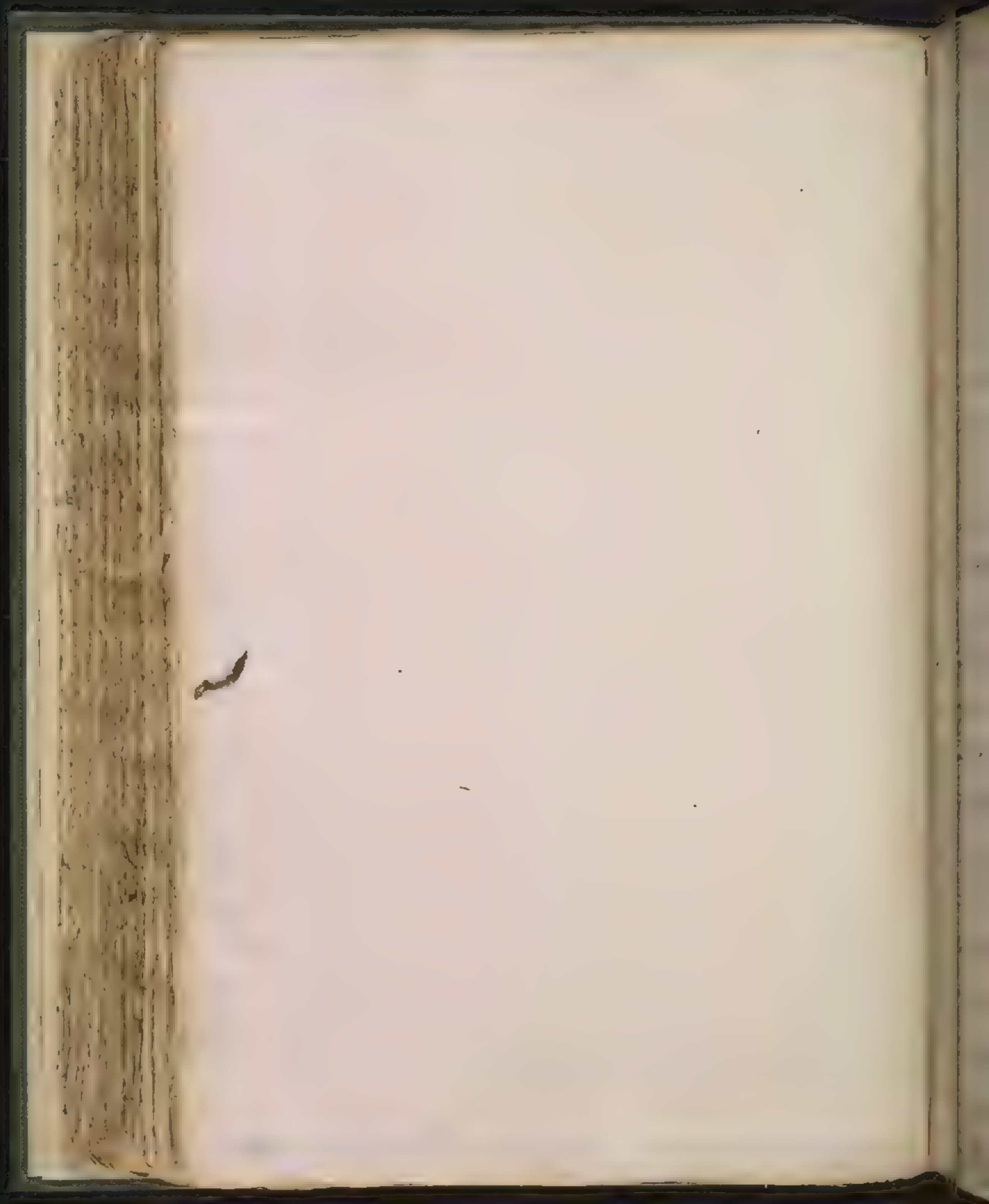
ing. dig.

*in 1781
to 5 & 4*

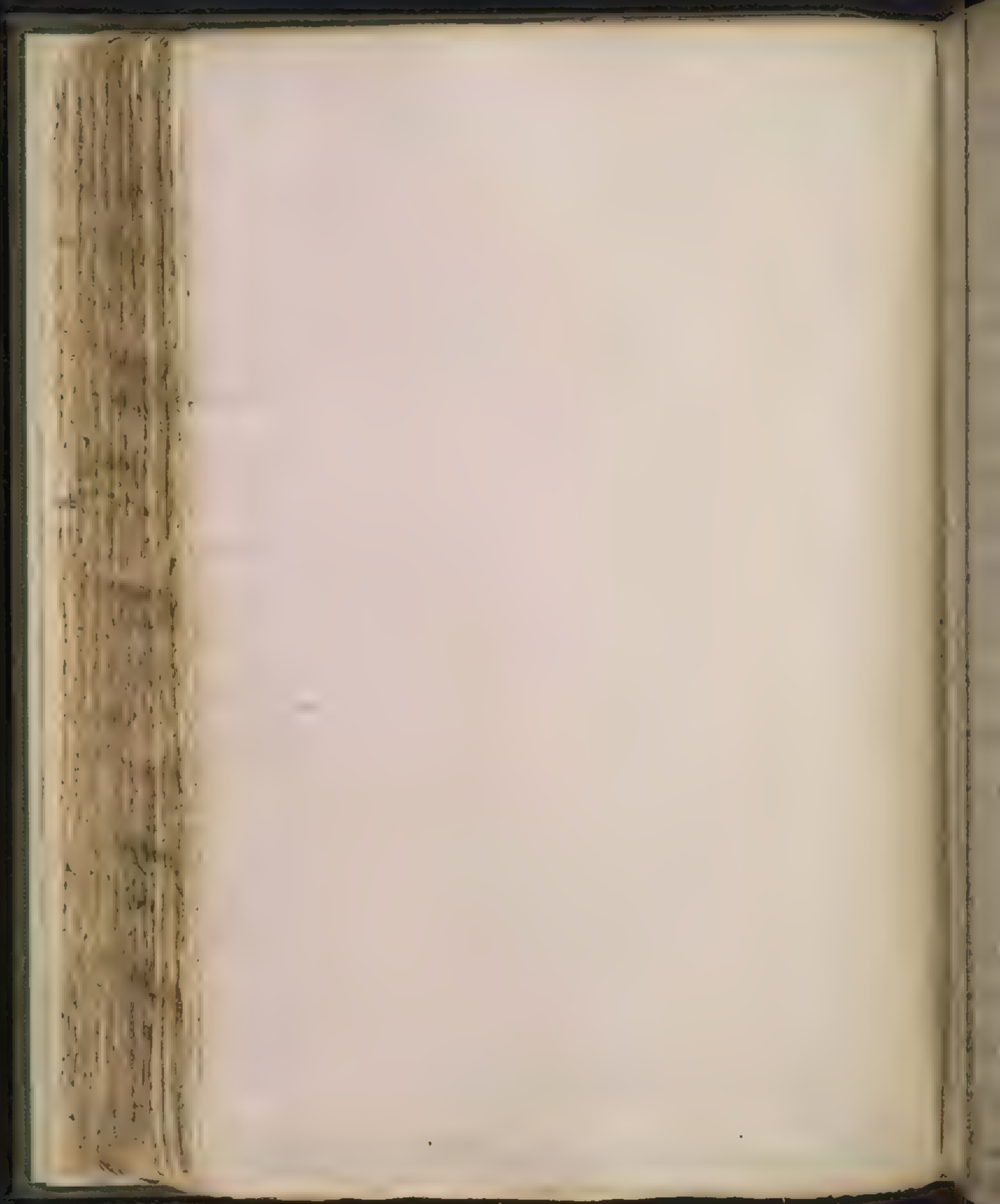
[Faint handwritten text at the bottom of the page, including the words "Do not" and "the" visible.]



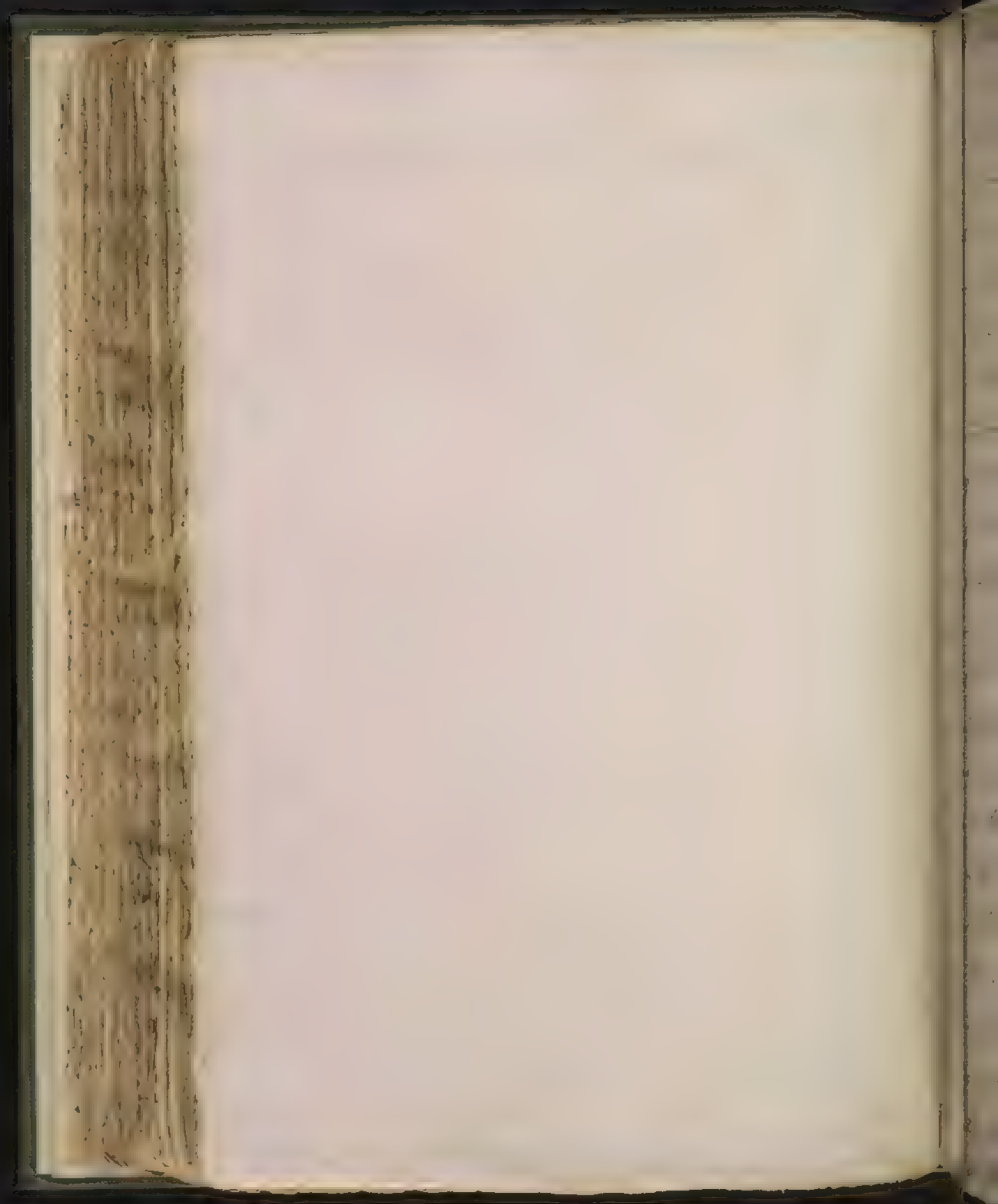
[The page contains approximately 20 lines of extremely faint, illegible handwriting.]



My dear friends
I have just received your letter of the 11th inst. and am
glad to hear from you. I am well and hope these few lines
will find you the same. I have been thinking much of late
of the state of the world and the future of our country.
It seems to me that we are passing through a great crisis
and that the result will determine whether we are to remain
a united people or become a collection of warring states.
I believe that the only way to preserve our Union is by
maintaining the principles of liberty and justice for all.
I am sure that you will agree with me in this.
I have no more to write at present. I am, dear friends,
very truly yours,
Wm. Lloyd Garrison



[illegible]



I have written this on the same day
as before - it is proposed

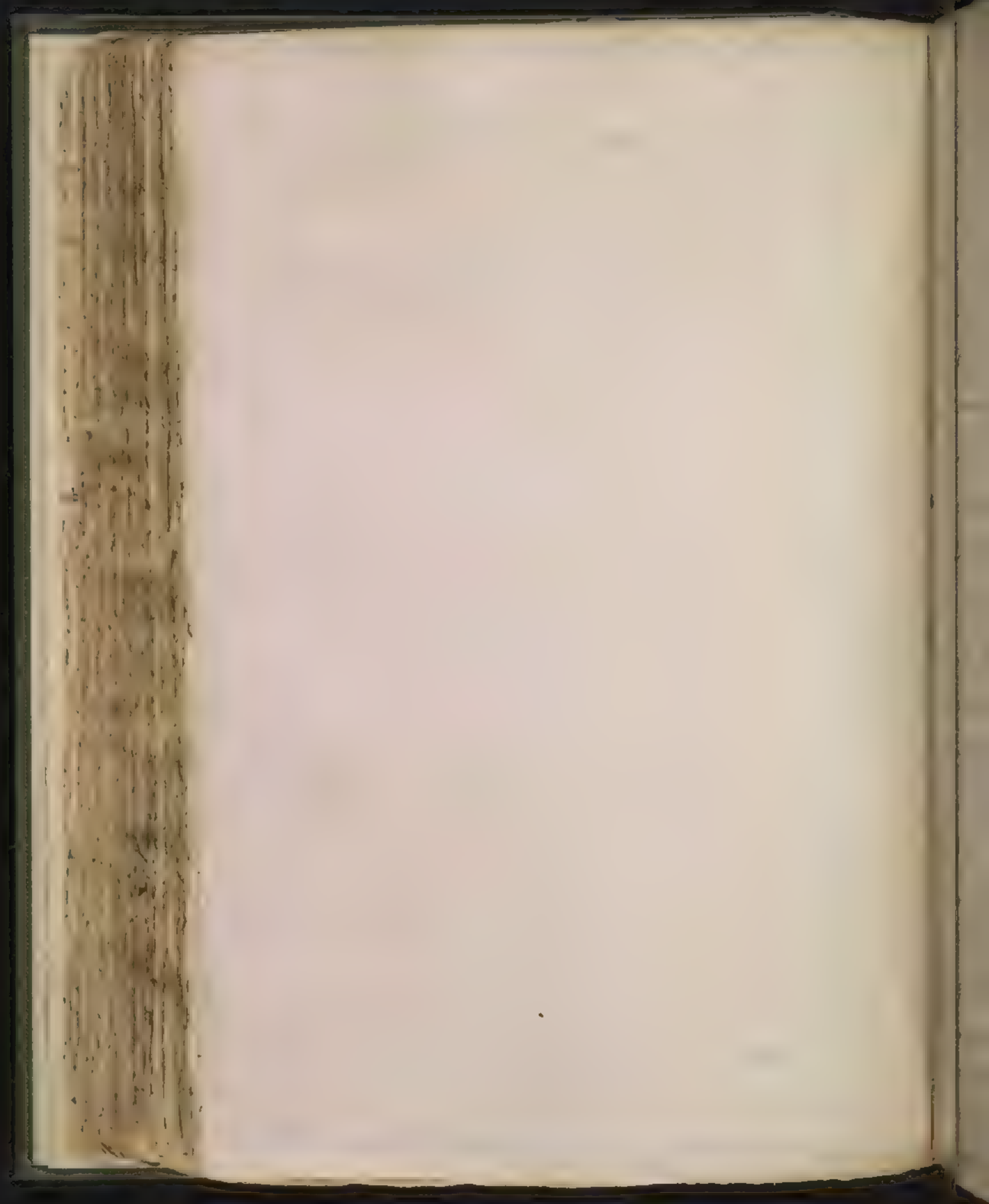
...all in dis...
...to be a...
...add...
...by...
...to...
...and...

...the ...
...of ...
...the ...

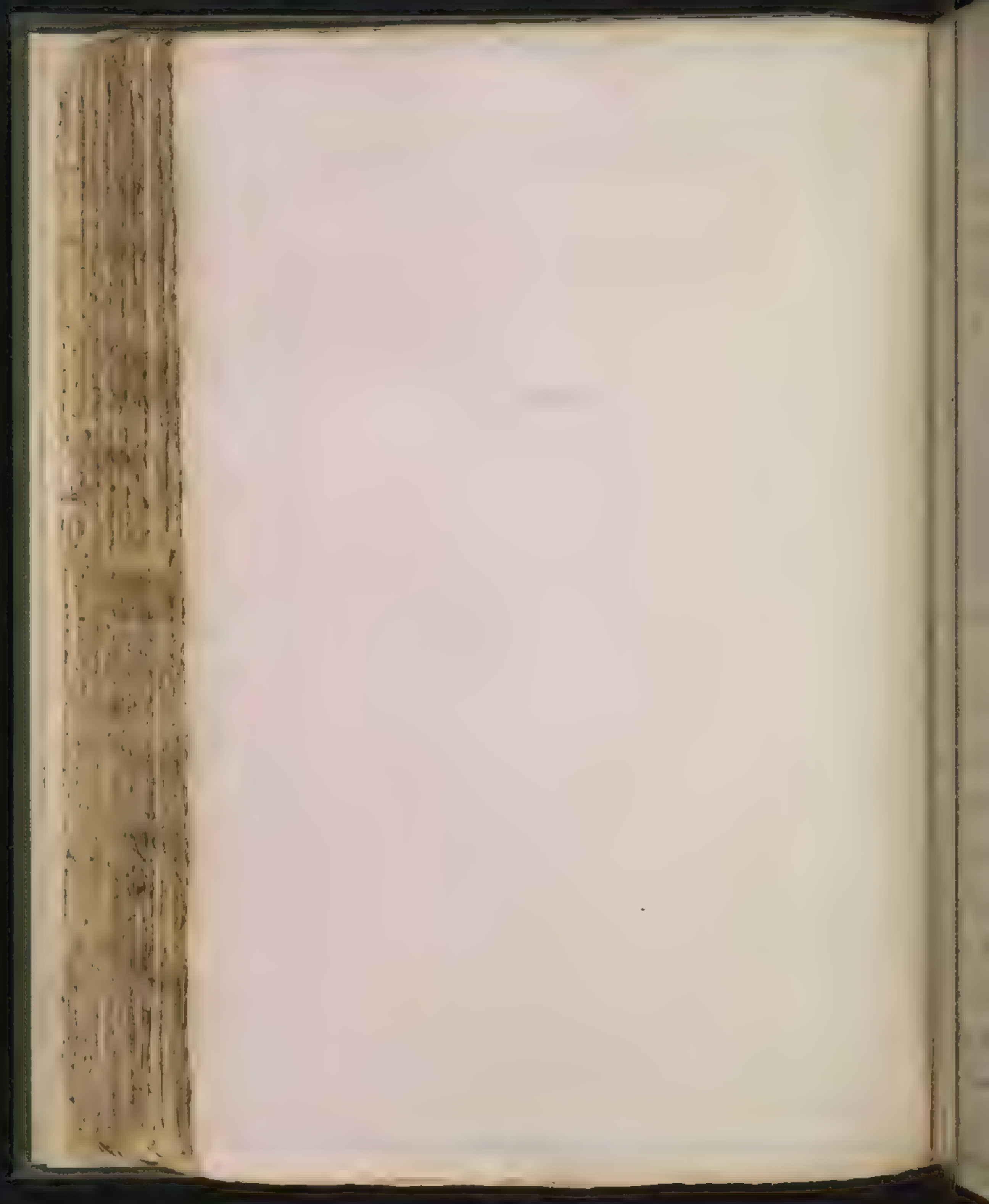
I shall now
under the pressure or weight it will stand
and I shall also
this is a very great height
of water - I would like to see what it

The effect of the water is to
get the degree of heat, add and subtract
and the power of the water is to

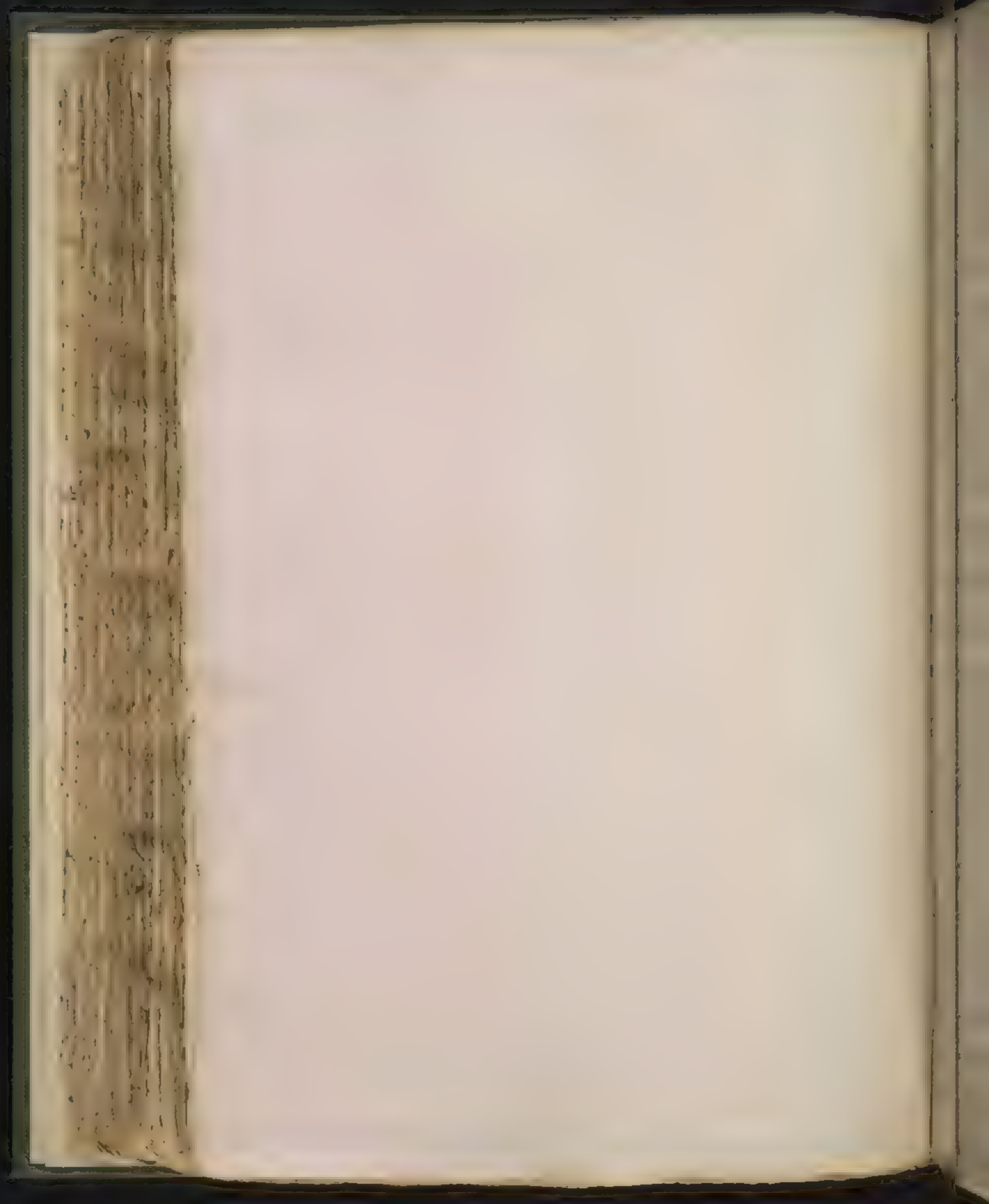
as the routes are only, accessory & detour
to the degree of localities. The routes are
destined to be in such a way as to avoid the



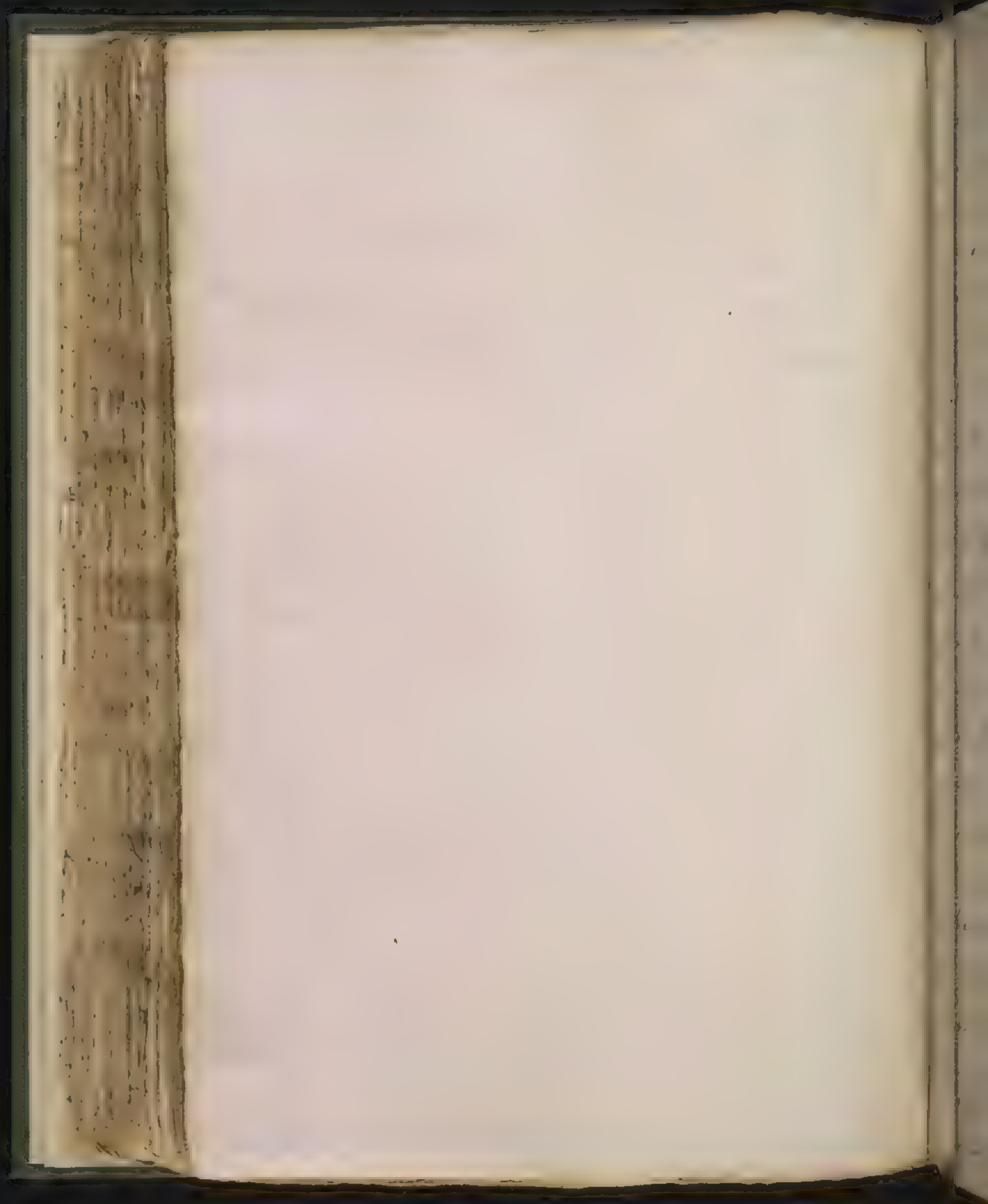
[illegible]



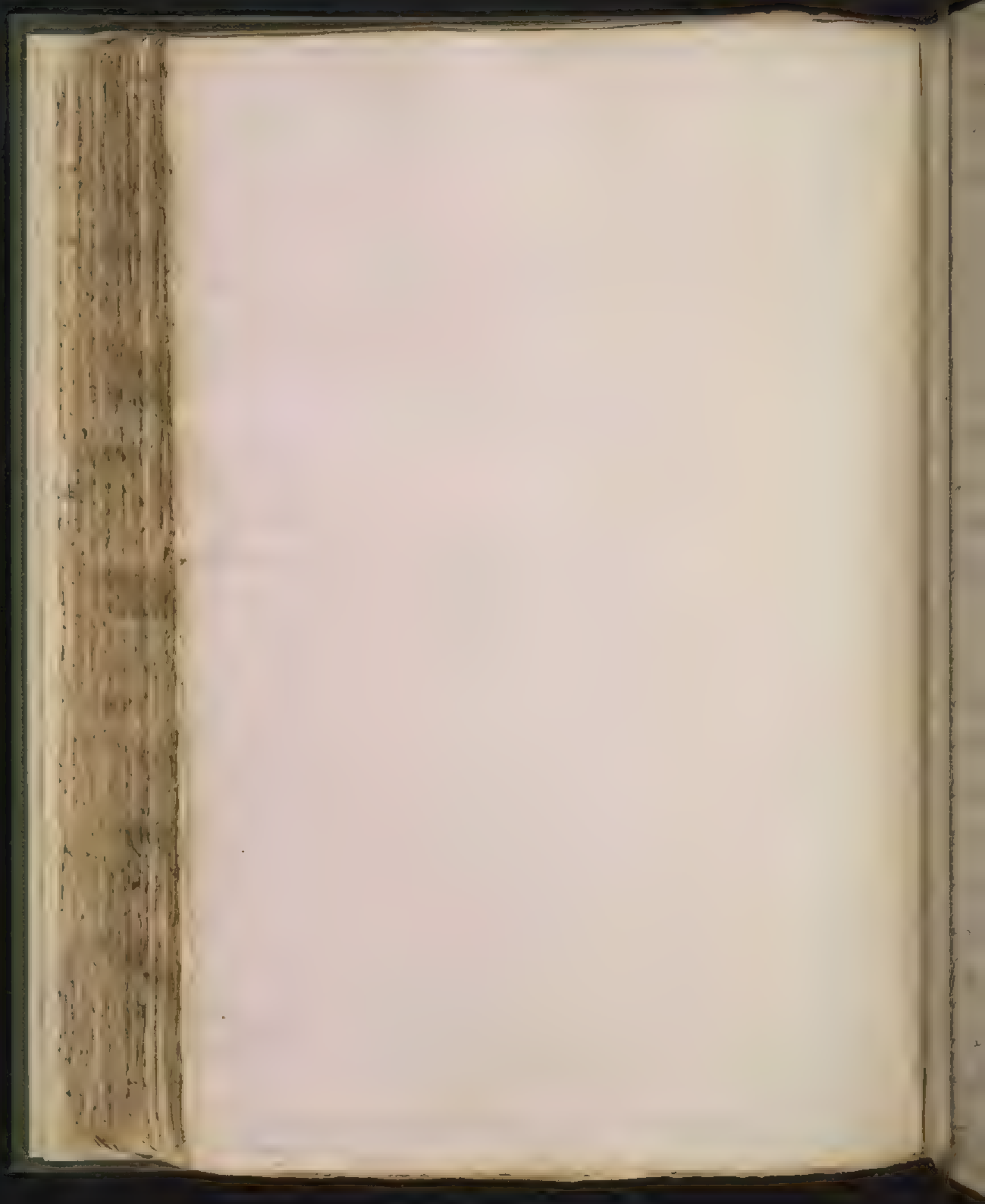
[Faint handwritten notes, mostly illegible due to blurring.]



[illegible]



[illegible]



... ..

...

...

... ..

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...

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...

...

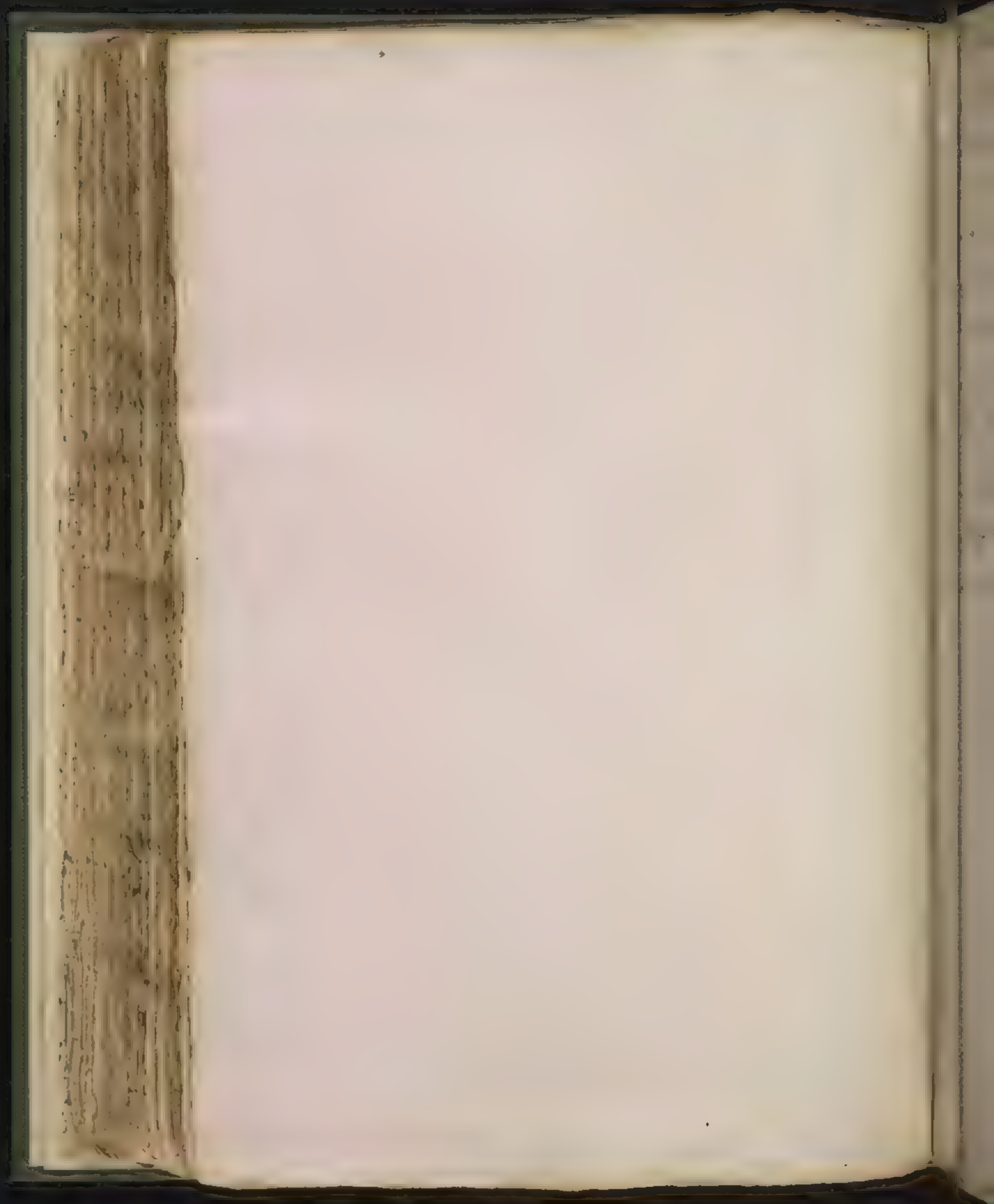
...

...

...

...

... ..



My dear Mr. [illegible]

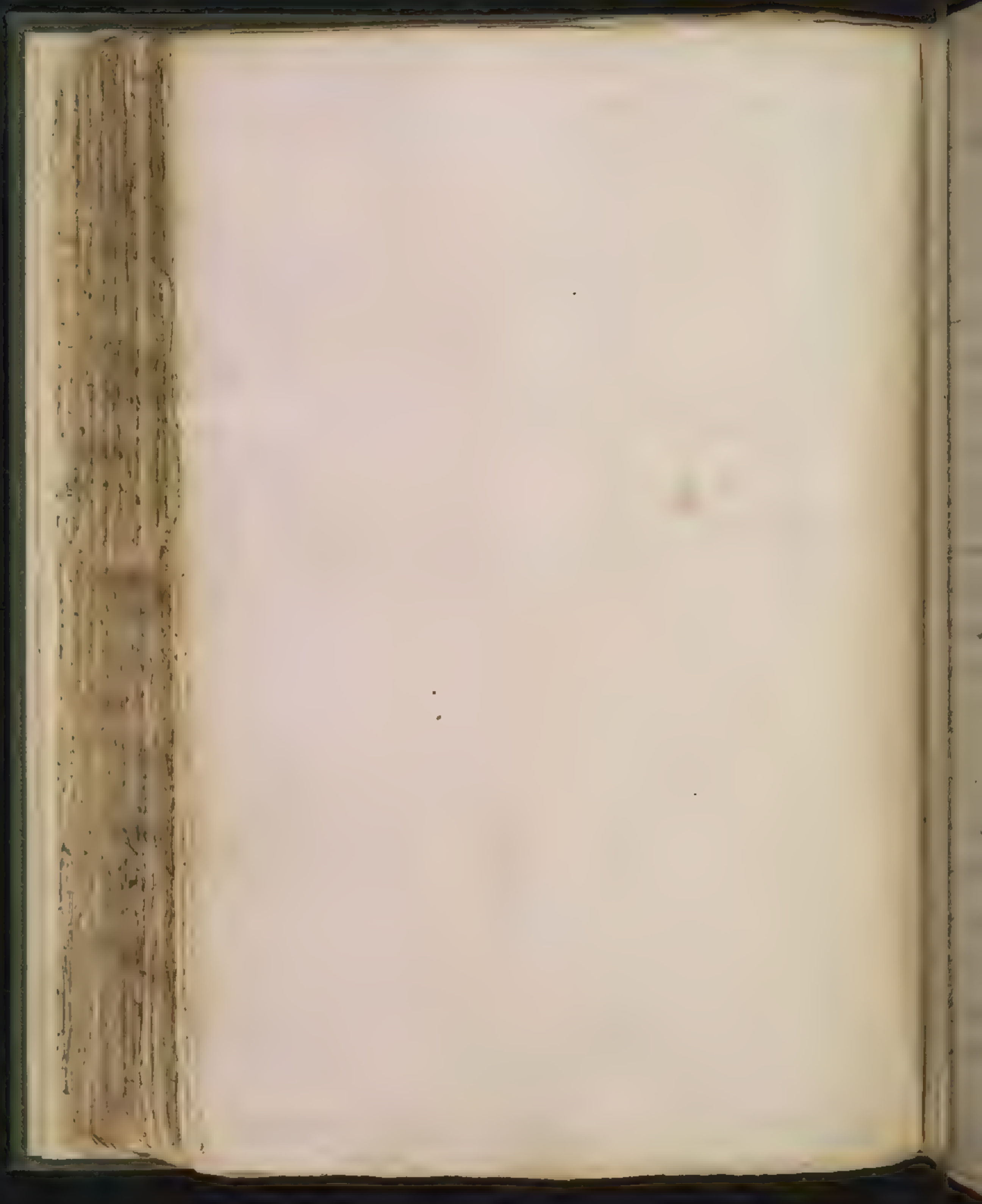
[illegible]

[illegible]

[illegible]

[illegible]

[illegible]



of the 1st of 1711.

on the 1st of 1711.

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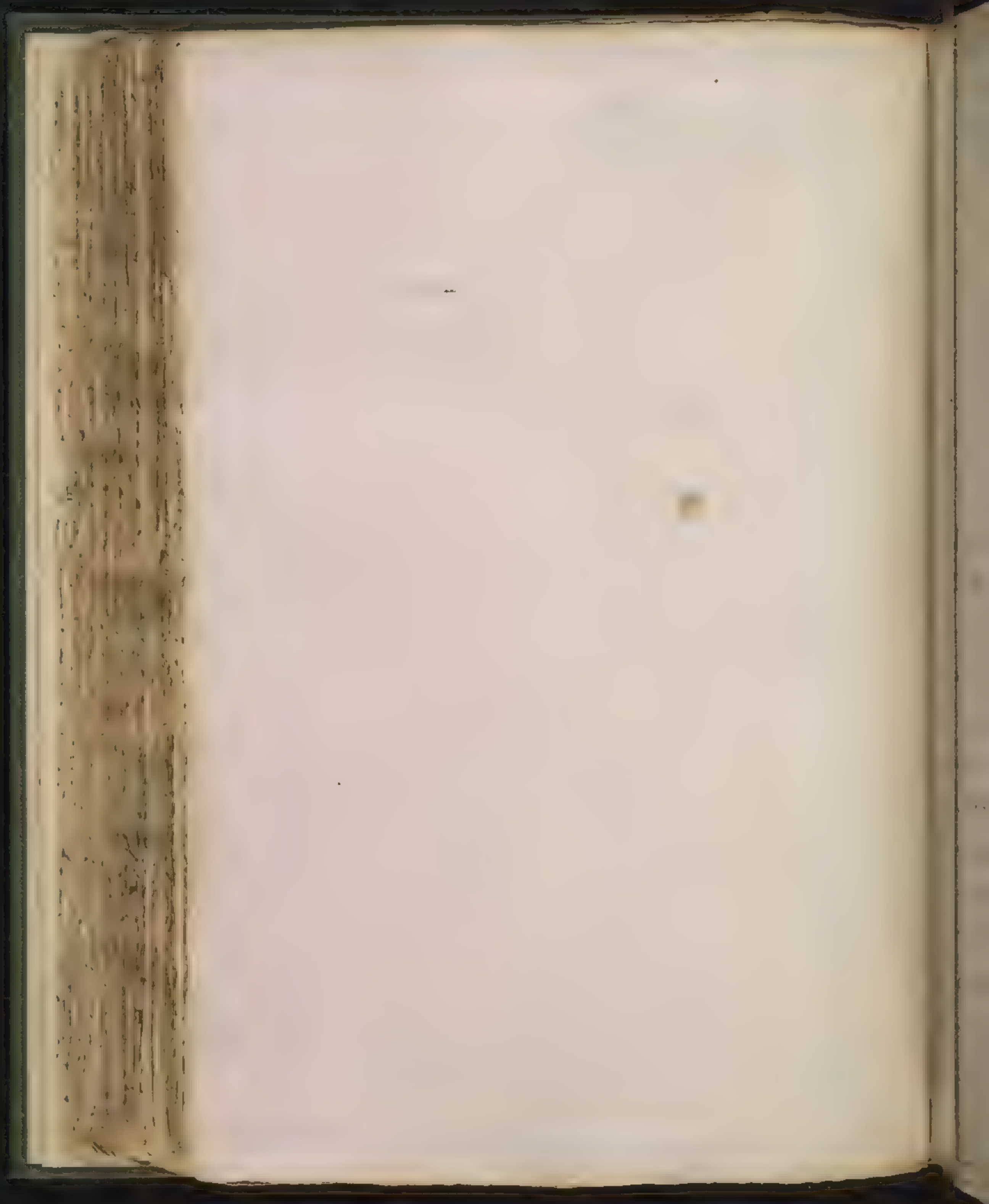
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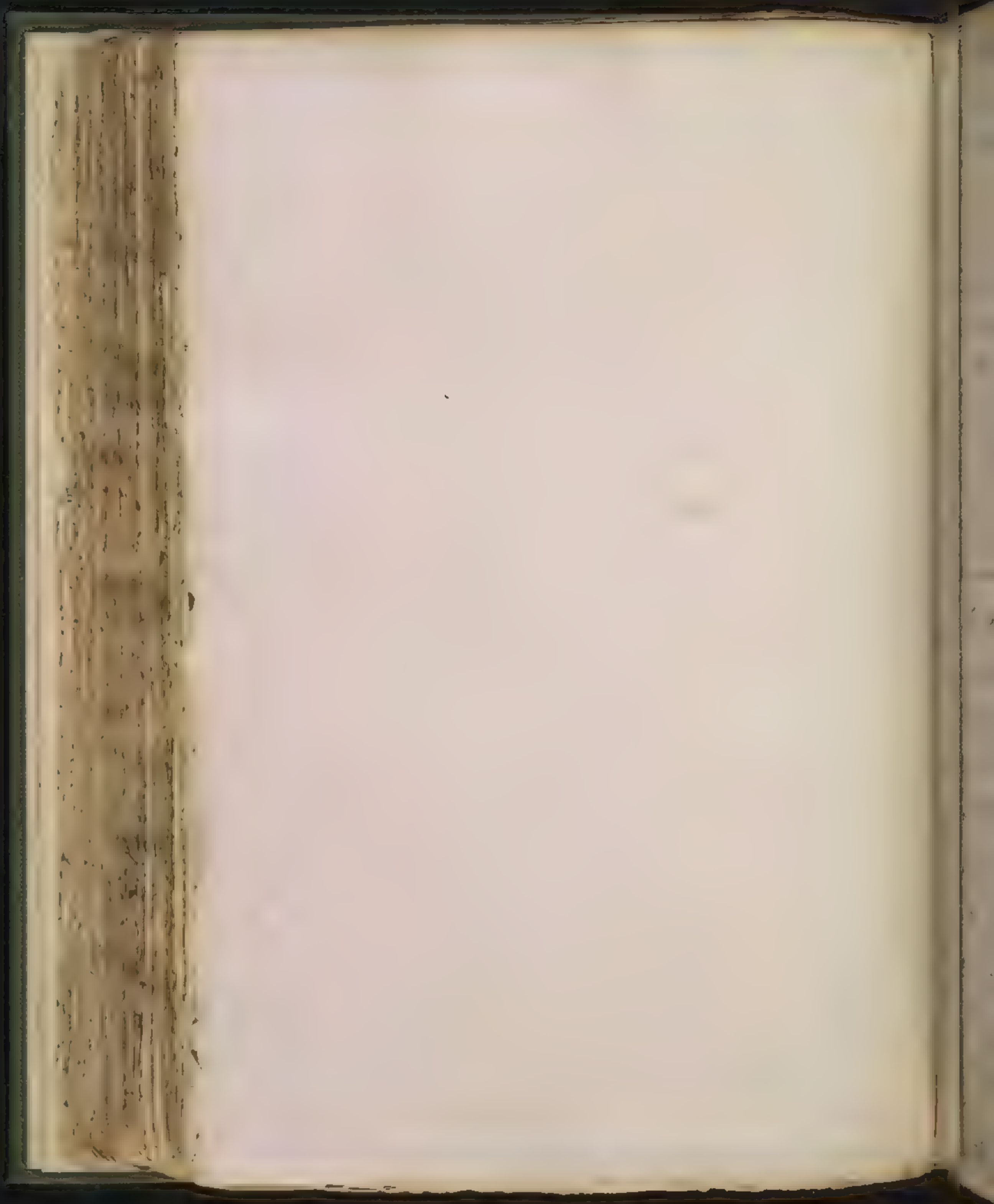
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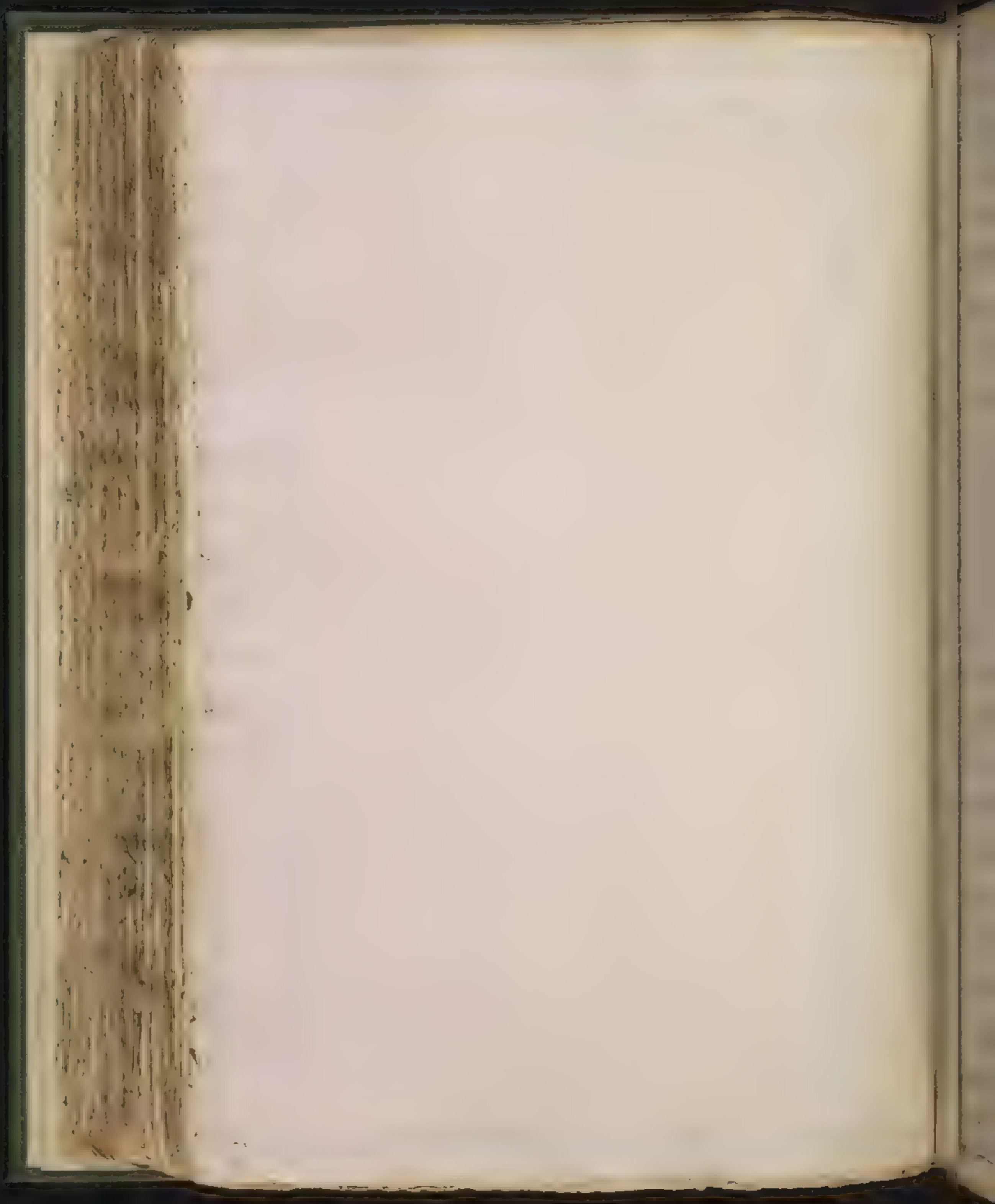
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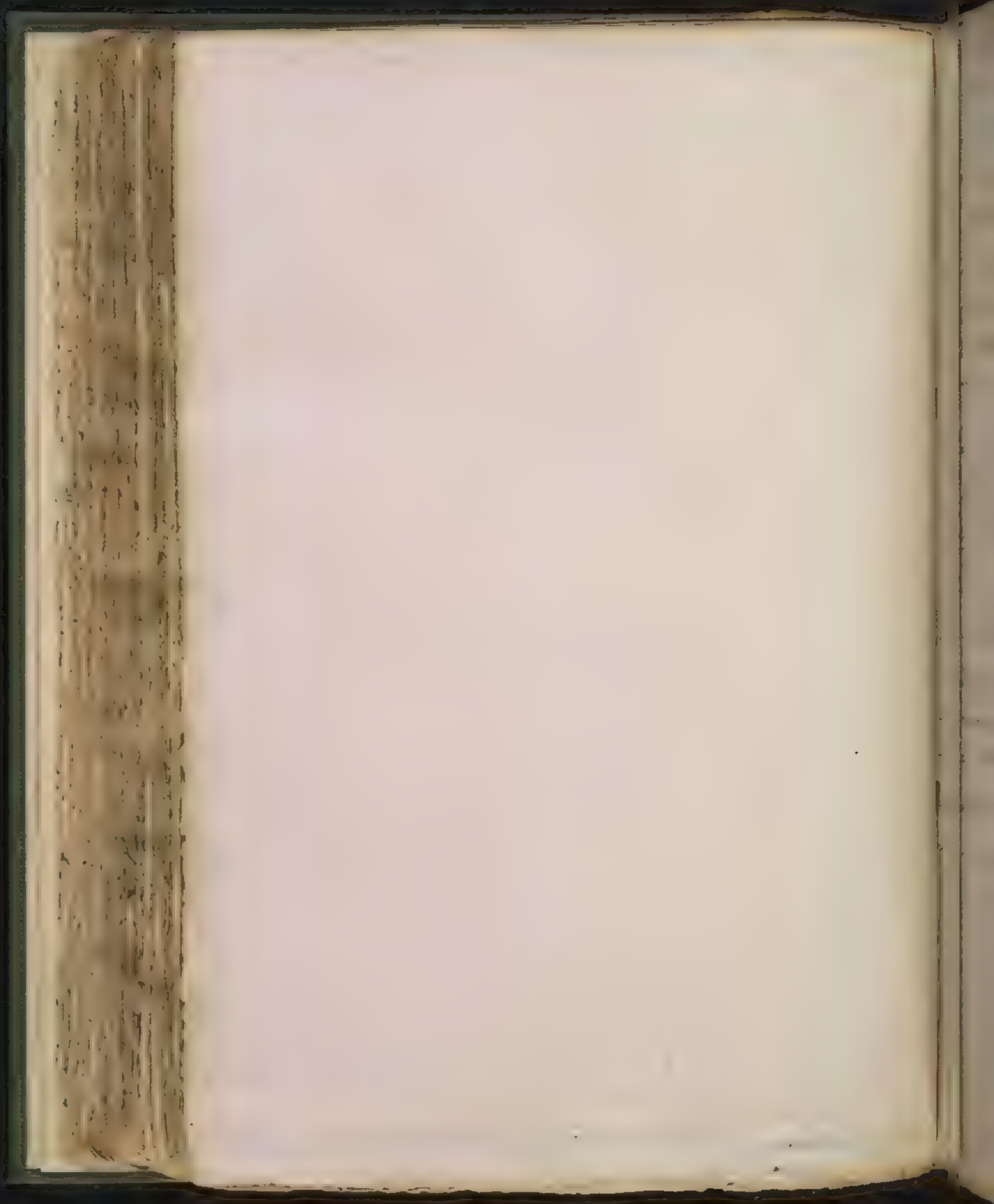
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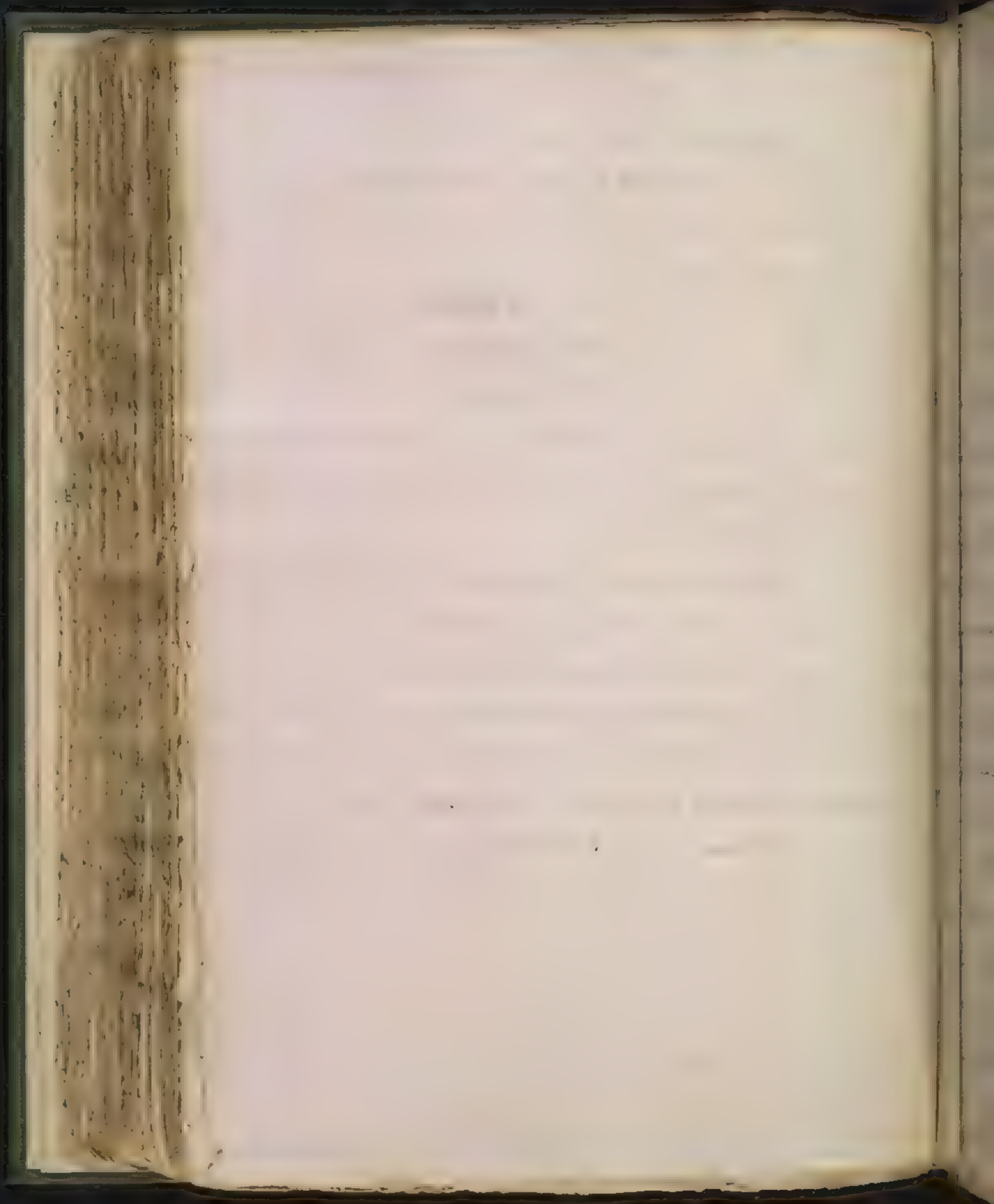
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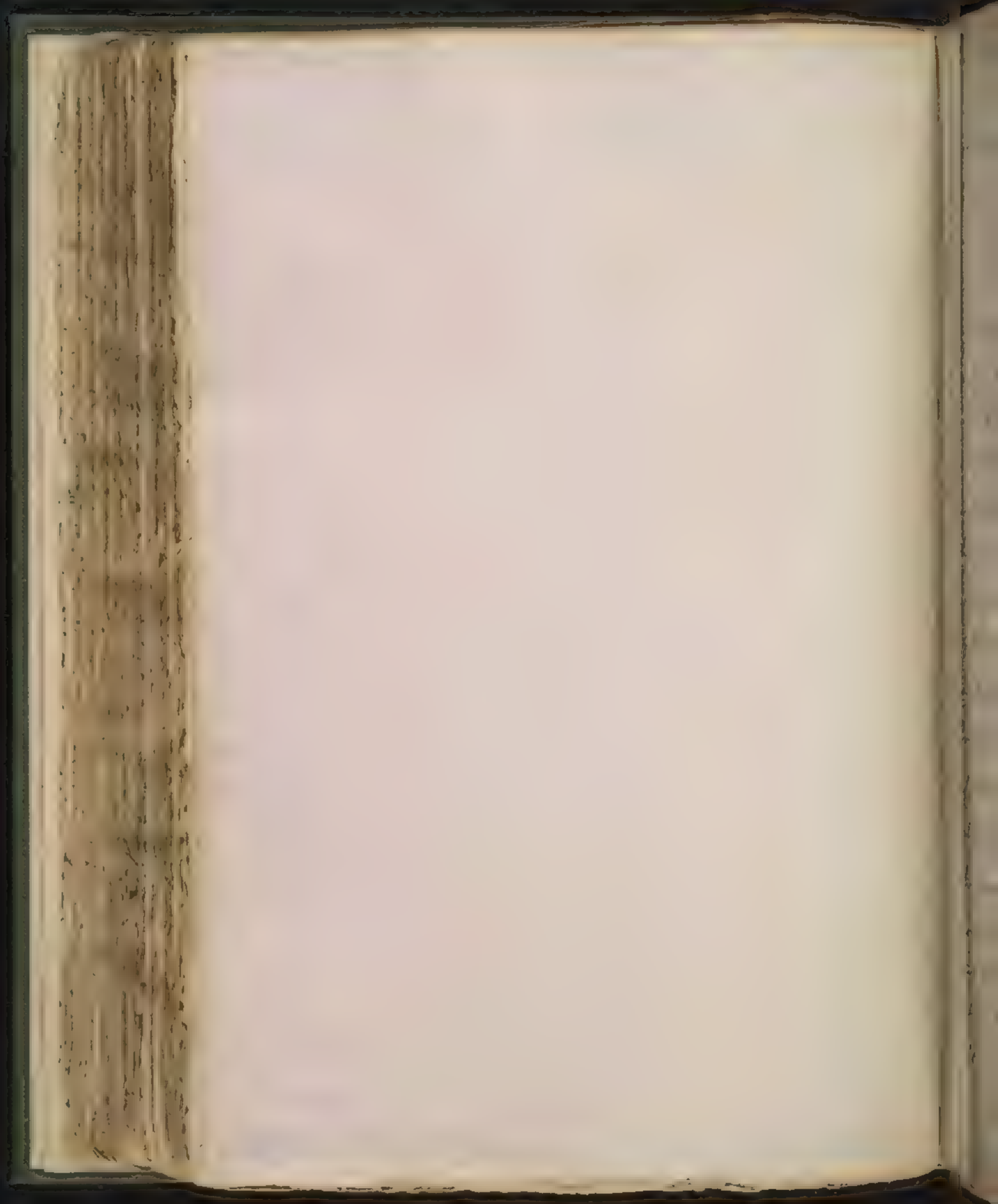
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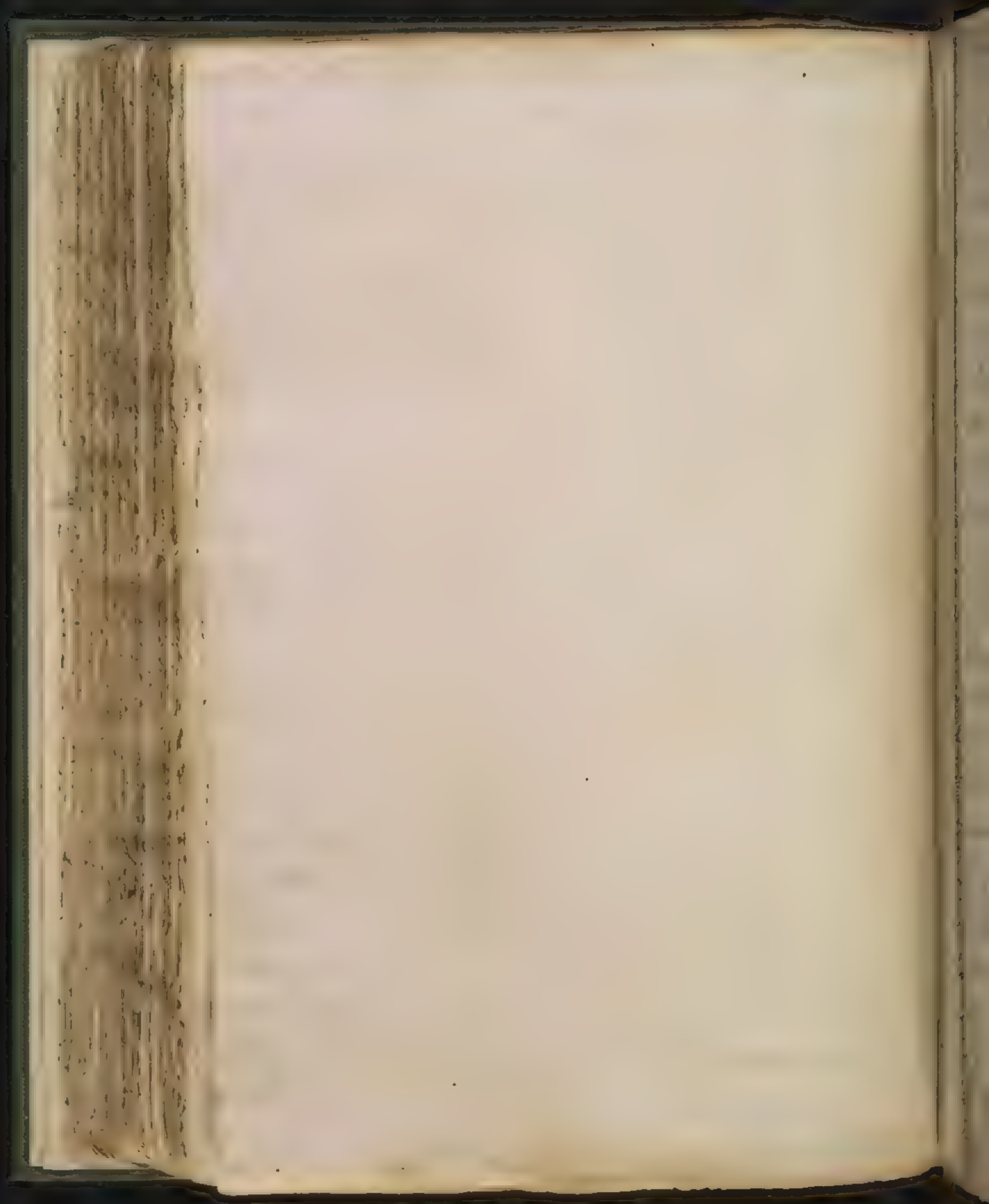


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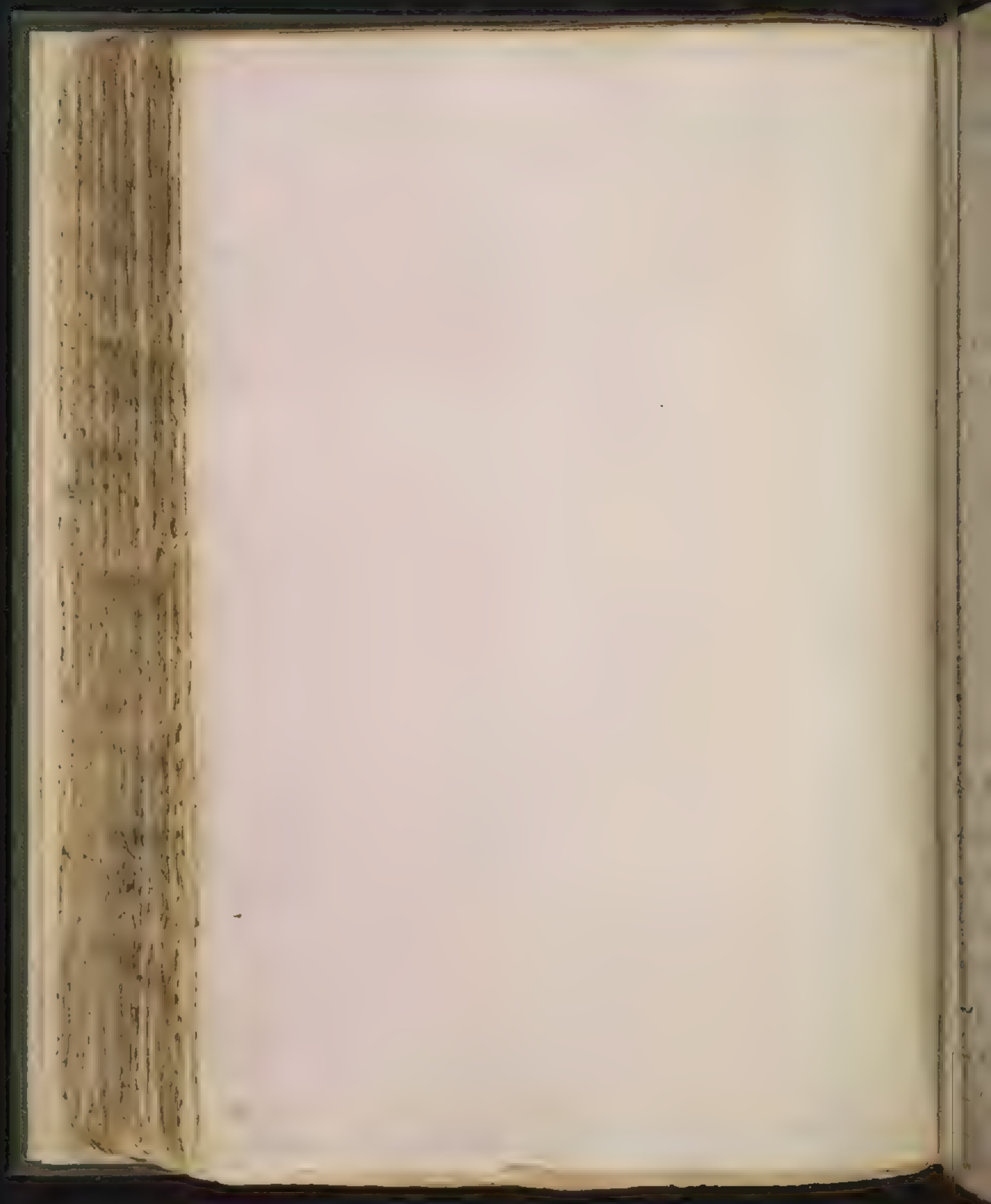
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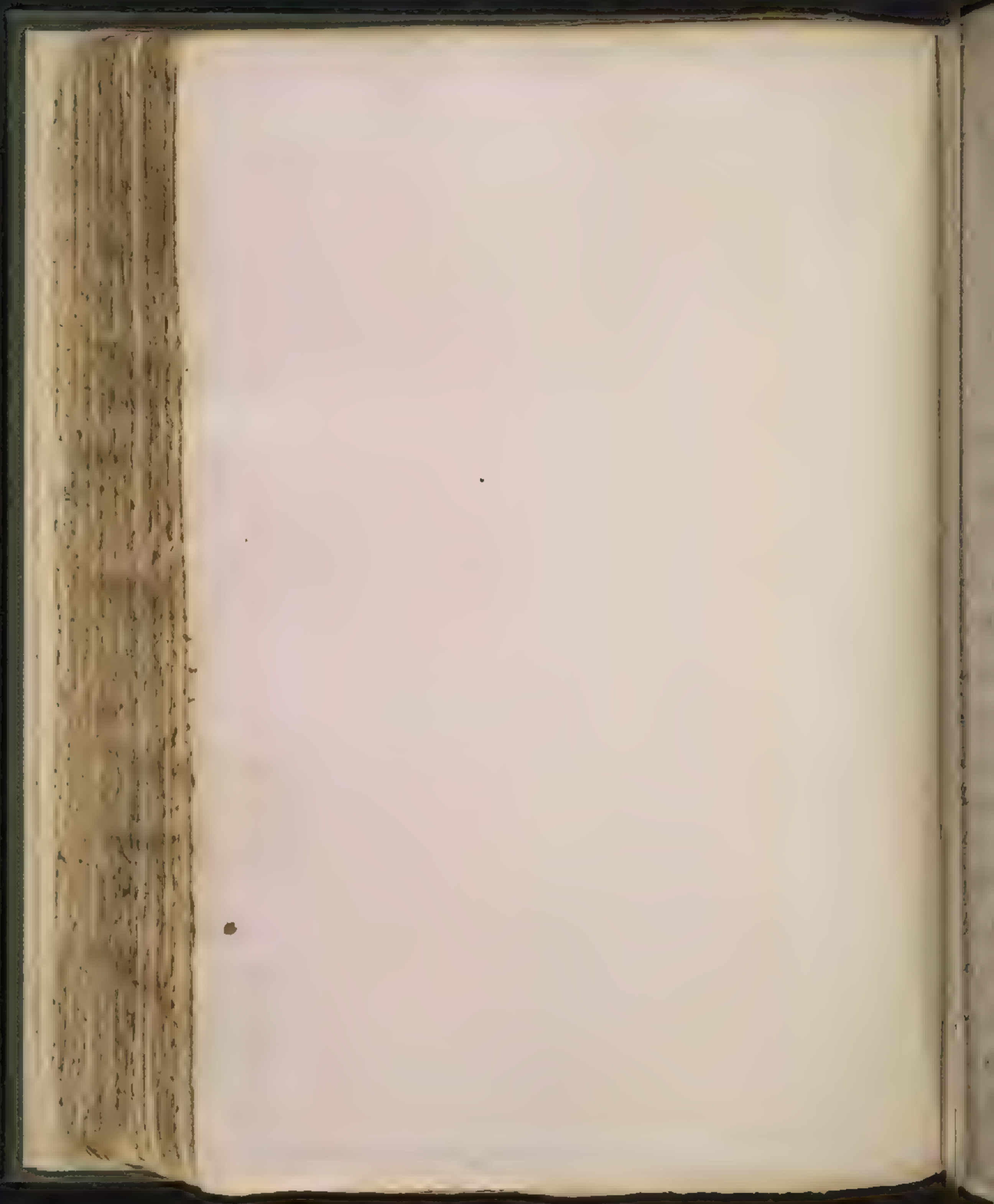
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The first thing I noticed when I stepped
 out of the car was the cold. It was a
 sharp contrast to the warm blanket of the
 car. I shivered slightly, but then I
 remembered that this was the first time
 I had ever been to this place. I had
 heard so much about it, but now it was
 here. I took a deep breath and
 looked around. The street was wide and
 empty, with a few cars parked along the
 side. The buildings were old and
 grand, with many windows. I
 walked down the street, feeling a
 sense of adventure. I had heard that
 the weather was perfect, and now I
 knew it was true. The sun was
 shining, and the air was just what I
 needed. I had come to the right place.
 I had found my home.



The first of the month of the year
 was a very fine day and the
 weather was very pleasant. The
 wind was from the north and
 the sun was shining. The
 water was very calm and the
 boats were all at anchor. The
 people were all very happy and
 the day was very successful.



The first thing I noticed when I stepped
out of the car was the smell of the sea.
It was a fresh, salty breeze that seemed to
wash over me, clearing away all my worries.

1. The first part of the document is a list of names and dates, which appears to be a record of some kind. The names are written in a cursive script, and the dates are in a more formal, printed style. The list is organized into two columns, with names on the left and dates on the right. The names are: John Smith, James Brown, William Jones, and Thomas White. The dates are: 1810, 1811, 1812, and 1813. The list is followed by a signature, which appears to be "John Smith".

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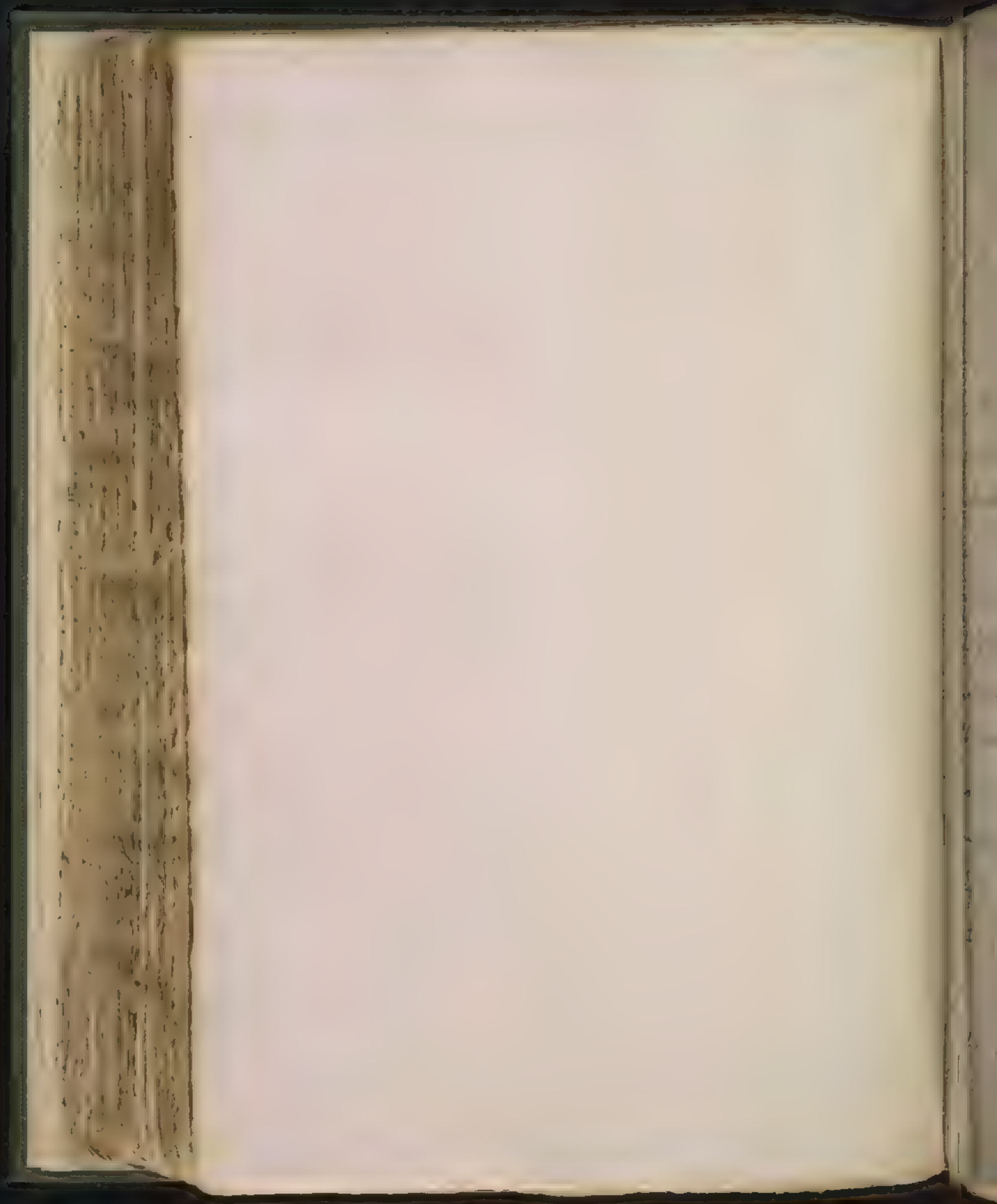
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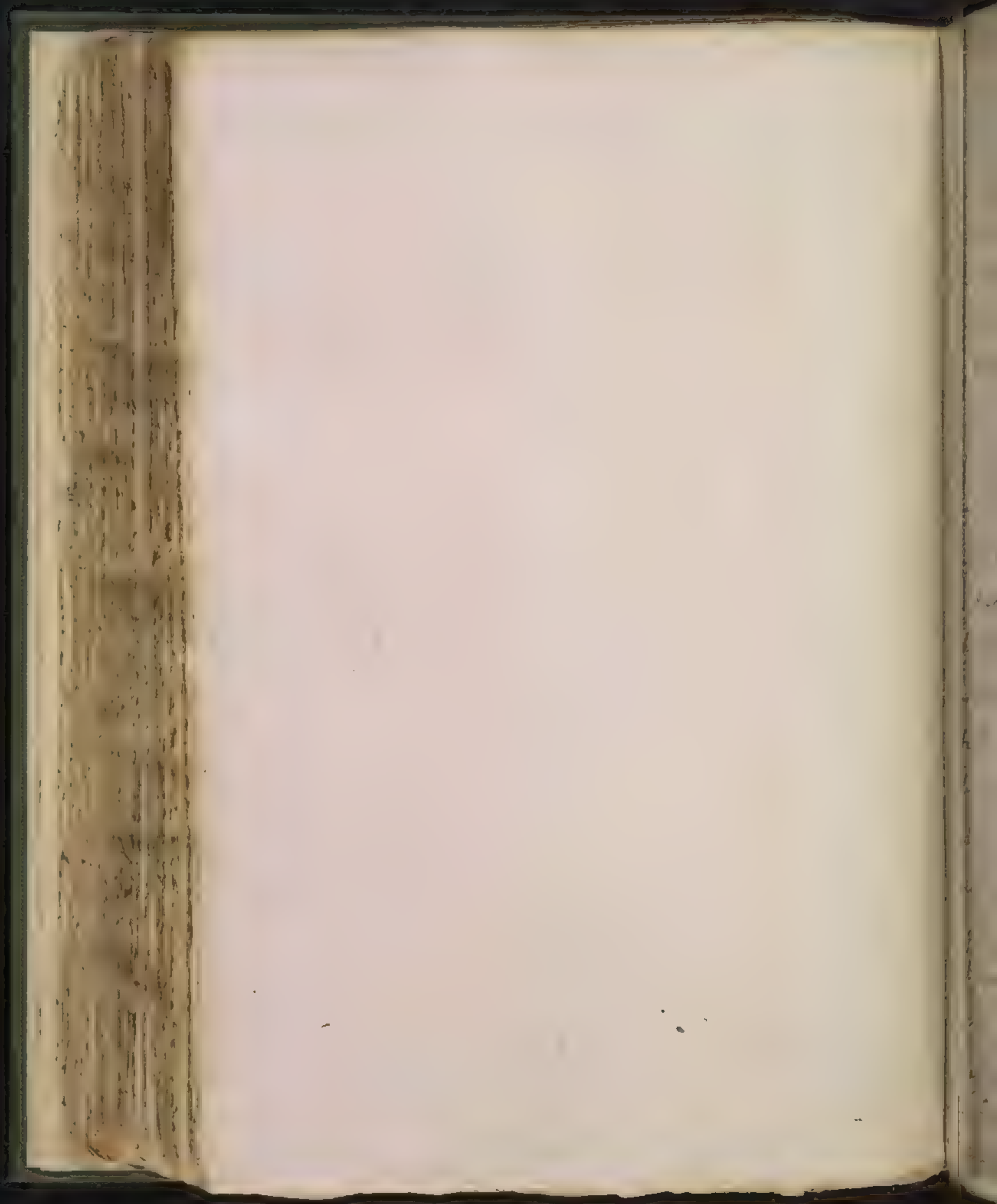
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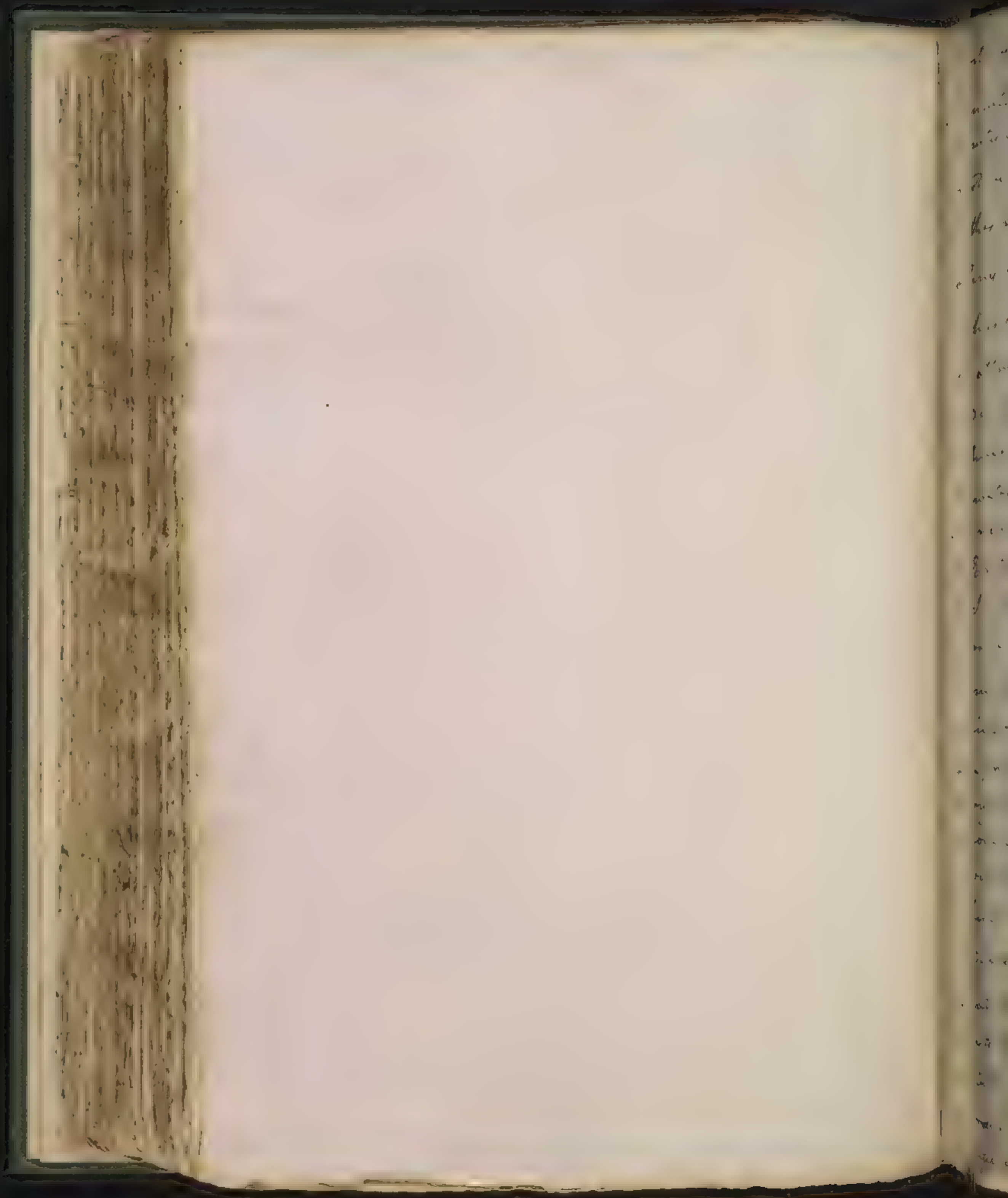
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3rd It has the strongest attraction for the principle of
inflammability, the dark color which is sometimes ob-
served in the vitriolic acid is not natural to it but
is owing to some heterogeneous body being dissolved
in it ~~which~~ which contains the principle of inflam-
mability, it may be rendered colorless by boiling
by which these matters are either dissipated or
consumed. When combined with the pure prin-
ciple of inflammability it forms Sulphur and
Sulphur and have the greatest instances of the
change produced by mixture. The vitriolic acid
and princ. of Inflamm. in their separate state are
both very active but sulphur is a mild substance
and may be taken in the system in considerable
quantities with very little effect. Mixed with
the oil of olives it produces a kind of dark substance
similar to Tar from which Sulphur may be pro-
duced. It unites with oil of Turpentine with great in-
tensity, producing heat, elevation and copious
fumes. It unites with spirit of wine forming a
compound.



It unites with the vitriol. Other

It unites with all the metals except gold. It will not unite with iron or zinc unless diluted with water.

It must be highly concentrated to dissolve copper.

All other metals require a concentrated acid and

a boiling heat to dissolve them

It has a strong attraction to water so that 7ij

will attract 3i of water from the air in 24 hours.

Hence it enters into the composition of mineral waters

It produces a considerable degree of heat when mixed

with water which becomes milky and deposits an

earth sediment, which is a species formed by the union

of the earth contained in the water and the vit. acid.

It also generates a considerable degree of cold in

the ice & a kind of solution can be made

It unites with all animal and vegetable substances

corroding or dissolving them; with them it forms a black

as in proportion to the air they contain it will unite

with vegetables, thus it is found sometimes combined

with common wood.

The vitriolic acid is supposed to be a kind of nitrogen in the

air. This opinion is founded on the following facts, if oil

is left in exposure to the air for some time, we are

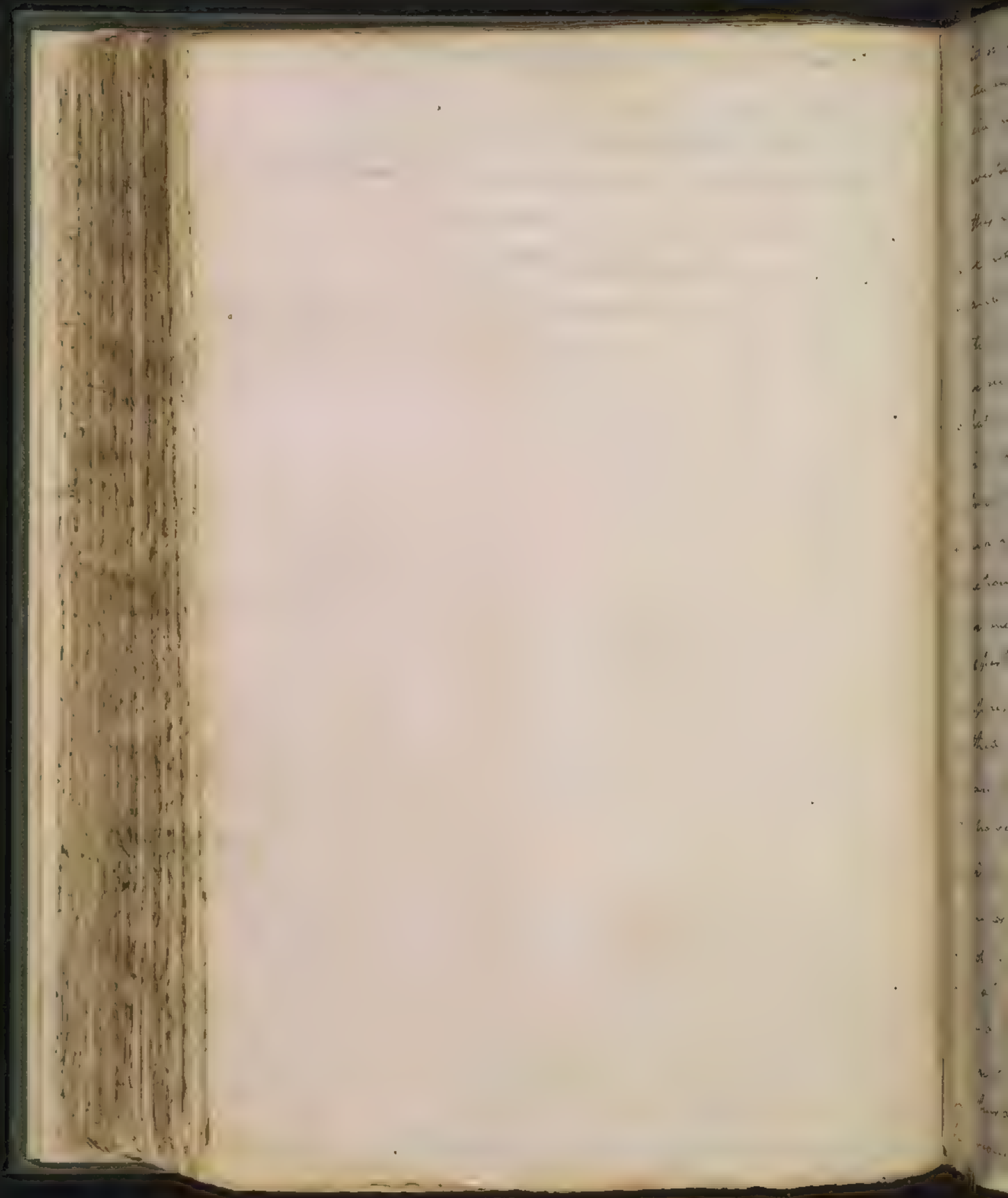
told that the vitriolic parts are formed according to the

nature of the oil. We may say that we cannot

doubt the accuracy of the experiments 104

was exposed to the air for 6 months and showed

no change in it. But further if the air abounded with



this acid so much as that when exposed it would sometimes be
collected and fall in rain or snow. Mr. Marquet would not find
any acid in either of them. Mr. Thau supposed that wood might
be converted into green vitriol by being exposed to this air
and other acids may form a substance similar to green
vitriol when combined with iron. There is no doubt
of an acid in the air which arises from the fermentation
of vegetable substances sometimes found growing in it
in some cases that iron is corroded by it. But later experiments
show that water will corrode iron. Thus the moisture of the
air will corrode iron until it therefore is not owing to
the vitriolic acid & certainly not iron sulphate or iron
this acid as metallic substances are corroded
by its action. But Electricity ^{is} seems to be found ~~in~~ is of an acid
nature and it is quite probable an acid of a particular
kind & perhaps it carries with it the acid diffused in the
atmosphere. The vitriolic acid is never found in a pure
state but always combined with some other
substance. There are no proofs of the vitriolic acid existing
in the novel, if the earth in a pure detached state contains
no more. The vitriolic acid has the strongest ob-
jection, as the ~~of~~ element is most frequently found in the
form of sulphates. It is also found combined with the
fossil alkali forming proboscis salt and with the ve-
getable alkali forming vitriolated tartar which is
found native in many vegetables and may be produced
from their acids ashes. It sometimes is found combined with
calcareous substances in the state of Sulphates and with
argillaceous
ore

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argillaceous earths in the state of lime likeness sometimes
with slate and common stone. With many of the metals
iron, copper and Zinc are the metallic bodies, with which
it is most frequently united by nature. As the iron it forms
of Martite, green vitriol or copperas, with copper it forms
blue or Roman vitriol, and with Zinc white vitriol.
When combined with other metals it gives its name
from them. It is frequently found in mineral wa-
ters most commonly from a decomposition of it, so
great is its attraction for all the substances in nature that
it is sometimes found combined with even wood itself.

The vitriolic acid is most commonly extracted
from vitriol alum and sulphur. The practice of ob-
taining it from alum is now much neglected. Vitriol
acid sulphur and most employed: from the last it
was out of it have been procured, for the process see May
and Baerhavi's Chemistry. When green vitriol is em-
ployed it is best to calcine it to dehydrate its water and
fuse it. Formerly not more than 2 or 3 Lbms
were procured from one pound, by burning it in a
pan or under a bell. Now by an improved this method
by admitting fresh air thro a long tube, but no iron
a great quantity was dehydrated in vapor. Boerhaave
Linné has greatly improved the method of obtaining
it from sulphur. It is by the addition of nitre, by which
means the sulphur can be consumed without any
communication with the external air. The proportion
is 6 lb of nitre to 100 lb of sulphur. The nitre or wood should
see

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and hereafter contains dephlogistated air in it which has the
property of feeding flame. Mr Ward has lately obtained a po-
tent for the method he pursues of procuring the volatile
acid from Sulphur. This method is only in the hands of
a few in England and Scotland. Various conjectures
have been formed concerning the manner in which this
process was carried on. If we may judge from the un-
common size of the vessels it is nothing but won-
derful improvement of the method used by Dr. L.
The volatile acid is small, all combined with Sul-
phur in the form of Sulphur and has it from occasional
causes (as Volcano's subterranean Fires &c) been decomposed
and combined with metals & alkaline salts &c. It is
usually combined with the most Salustances and on account
of its greater attraction to the ~~Earth~~ than to any other substance
it is sought for frequently and went over to it. Many
things might be said on both sides the former however
seems most probable. The Specific Gravity of the vitri-
ol is to water as 19 to 10. The Volatile vitriolic acid
is only the vitriol: acid united with a superabundant
quantity of ~~Earth~~ and an oily matter in small quantity.
By analysis, vitriol. acid vid. Syllabus,

Of the Nitrous Acid

The nitrous acid is next in degree to the vitriolic. It is
a fossil substance and never found simple but most com-
monly found combined with an alkali forming the
Nitre of the Shops; when pure it is of a reddish color and
emits copious fumes. The fumes of it are acid and poi-
= sonous

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venous received into the lungs in over so small quantity pro-
duced pain. It is found in a compound state united with
the fixed or vegetable alkali

The nitrous acid is procured from these salts by 3 Me-
thods 1st By adding Brickdust or clay to nitre This acts as
a mechanical means by preventing union and hasten-
ing evolution some have proposed to treat dust or
contained vitriolic acid and this decomposed the nitre
But Mr Watt of Glasgow found that clay perfectly free
from oil & resin matter would still separate the acid
This is one species of addition this method is now laid
aside on account of the intense heat necessary.

2nd By adding green vitriol. In this the vitriolic acid
separates the iron and unites with the alkaline basis of the
nitre and the nitrous acid arises in red fumes the heat
prevents it from joining with the iron. Some add wa-
ter to condense the fumes but this much weakens the
acid it is better to receive the vitriol this method is
only used in large processes.

3rd By adding a concentrated vitriolic acid which at-
tacks the alkaline basis of the nitre and the ni-
trous acid flies. This is attended with much loss and
and trouble than any other of the methods the nitre is
to be calcined when and want a strong acid The
general rule is to add 1 part of vitriolic acid to 2 parts
of nitre. By this method it is obtained most pure. Mr L
objects to this method he says it leaves an insoluble
residue

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The residuum which remains is cleaned from the retort.
The London College recommends to add 3 parts of nitre to
one of vitriolic acid the residuum is removed to the
When we do not want to purify the residuum the
acid, no, action is the best. The residuum should be expo-
sed gradually to heat until red fumes arise. Then
more nitre will combine. Mr Wolf in the Philoso-
phical Transactions has given an account of a
very ingenious contrivance for confining and con-
densing these fumes by means of water. These vapors
are not sufficient to produce any heat in the wa-
ter. The acid thus obtained is generally combined
with the vitriolic acid and also with the muriatic
from a decomposition of the common salt which
the nitre always contains. Now are there to be separa-
ted from it? The answer is not difficult. The vitriolic
acid may be obtained by cohobation either by distilling
it over on the sand or a fourth portion of nitre. The alkali
quicksilver will attract the vitriolic acid. It is freed from
the muriatic acid by adding a solution of silver in
the nitrous acid, so great is the attraction the silver has
for the muriatic acid that it surmounts the attraction
of the nitrous acid with which it was combined and
unites with the muriatic forming with it an insoluble com-
pound.

When united with the muriatic acid it forms
a compound

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aqua Regia so called from its dissolving gold which is the
king of metals. It is the only solvent of this metal.

2^d It unites with alkalies with heat and effervescence
forming different neutral salts according to the
alkalis employed.

3^d With most Earths & to say, it forms salts

4th With the Δ with the greatest violence and with
flammability. Half an ounce of the nitrous acid added to
a quantity of the Δ . Tardus th. with a few drops of the
N. vitriol. highly concentrated will burst into a flame.
The ~~case~~ characteristic of this acid is its great attraction

to the Δ

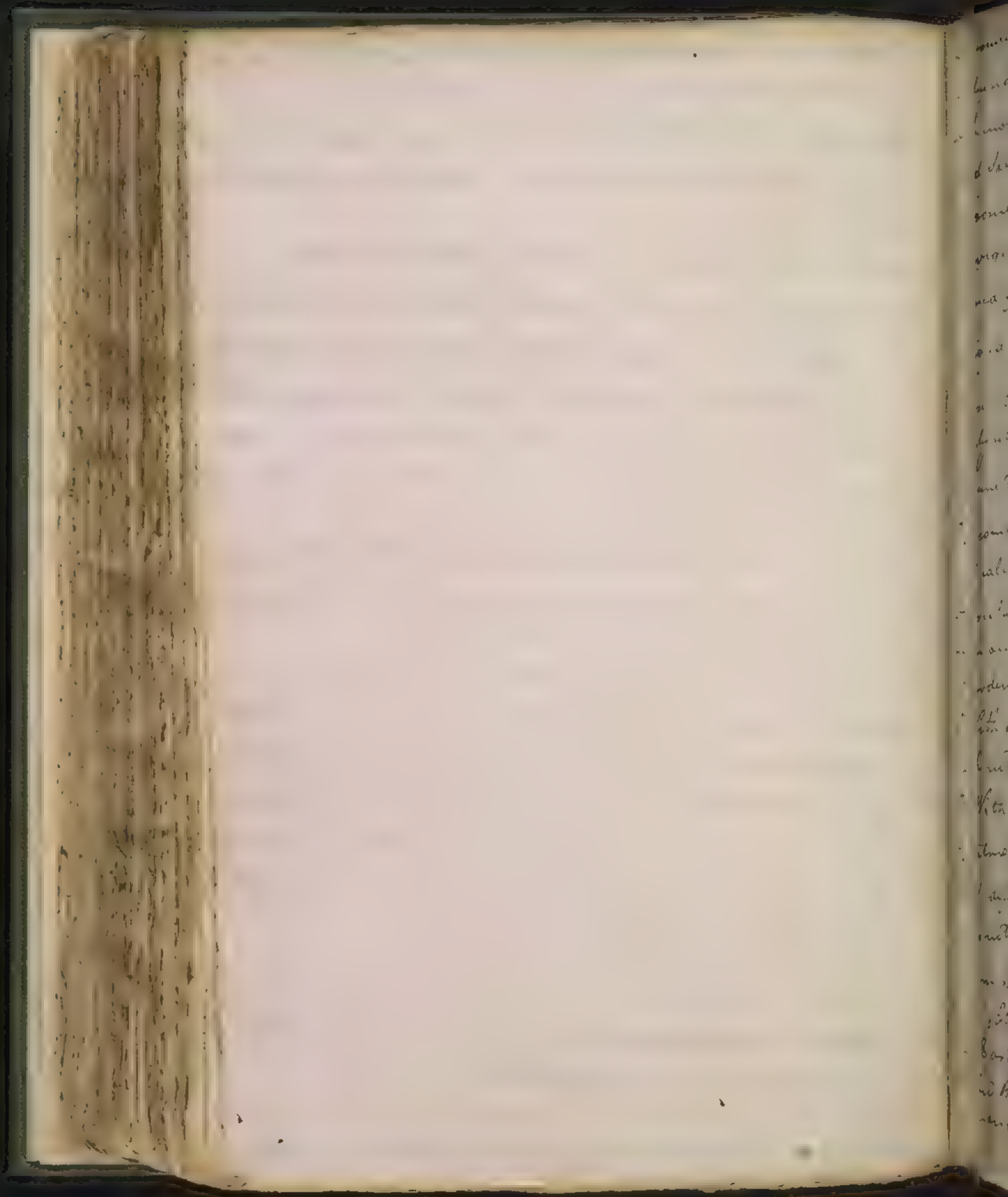
5th It unites with all the metals except gold, it corrodes
iron and Antimony without melting or dissolving
them.

6th With water causing effluvia heat and fumes.
It produces intense cold with ice and snow. It dis-
solves vegetable and animal substances like the vitriol. acid
It is used by Dyers in the dying of scarlet; by Refiners
in parting silver and gold. By book binders to mottle
papers and by engravers for etching in copper and brass.

Of the Muratic Acid

This acid is neither so volatile nor so powerful to the
lungs as the nitrous & much less so to the stomach
which well like saffron. Its specific gravity is to
water as 12 to 10. Heat only separates its Water

This acid is a natural substance never
found in a pure uncompounded state. It is found



in a combined state in common salt which is found
in abundance from the sea and is dug out of the
earth mostly in large hillside lumps and thence
called Sal gem. It is likewise in Sal ammoniac.
and some say in Borax. It is found in animal
and vegetable substances Urine &c. It is commonly
obtained from sea salt from which it may be de-
composed by nitre and vitriol

1st It unites with the nitrous acid and forms aq. Regia
the only solvent for gold which is the king of metals.

2^d It unites with all the alkalis forming neutral salts

3^d It combines with most earths forming a trichium fluid

with calcareous it forms Sal. ammon. fixum

4th scarcely with inflammables. It will not unite with
oil on account of the great quantity of water it contains

With ardent spirits it forms a mucous ether.

5th With all metals except gold dissolving them

it will not dissolve tin in the cold.

6th With water it does not produce heat equal to
the vitriolic and nitrous acids.

7th It dissolves animal and vegetable substances

It does not give them a black color. It is employed by
anatomists for corroding their preparations

It is obtained from common salt first by ad-

ding earth or sand to separate the acid from its

alkaline basis. This method is described and highly

recommended by Glauber.

2nd

* The same proportion is to be used as in the distillation of the nitrous acid. Some of the vitriolic acid will unite with the murretic acid and it is to be separated by adding calcareous Earth. This unites with the vitriolic acid and falls to the Bottom in the form of Sulphate. It has been common to put water in Receivers to confine the vapors which are more volatile than those of the Nitrous or vitriolic acids. Mr Wolfe's method renders this unnecessary and this method a vitriolic acid is obtained strong enough to form Althes with oxidized Spirits.

2nd By adding the nitrous acid to the common salt which detaches the muriatic acid

3rd By adding some of the compounds of the vitriolic acid to it. We cannot use the compounds of the vitriolic acid with metals on account of the great attraction the muriatic acid has for them. The flowers martiales are an instance of this strong attraction. It is most frequently obtained by using alum.

4th By adding pure Nitric acid to it. This is the best Method.

Muriatic Acid

It was discovered By Mr Scheele according to Fourcroy. This acid has been lately added to the Mineral acids by Mr Bergman. It is found to exist pure only in the form of vapor in which state, it has a very penetrating smell, extinguishes flame and kills animals that breathe it. It is obtained by means of heat from the water with which it is generally combined. In other respects it exists like other acids. Mr Scheele proves that it depraves silicious Earths and Soil. Priestly says that it corrodes glass. If this is the case it must be impossible to keep it confined in Vessels. It unites with all the Earths; it acts on most Metals and is a strong caustic when applied to the skin. It corrodes animal and vegetable substances. When mixed with water a great heat is produced and a white sediment is deposited.

As to its origin it is obtained from a certain kind

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kind of Earth called Char. It is probably only a very volatile pungent species of the muriatic Acid.

Of the Vegetable Acids

Then pass on to the general nature of the mineral acids and pass most of their distinguishing properties but are much weaker they effervesce with Alkalies impart sour taste to the tongue and change the Tyndal of violet to a red color. They are all obtained from vegetable substances and may be reduced to 3 kinds the Native, Fermented and Distilled of which we shall treat severally Boerhaave mentions 5. His ferment is the same with Mennont Gas Sylvester and is nothing more than the fixed air of the Body flying off Among the Vegetables Sorrel only yields a Crystallizable Salt. From 20 lb of the leaves is obtained 6 lb of the salt in a fluid state, from which Zij Zij and a Zij of Crystallized Salt may be procured.

Of the Native Acid

This is obtained by expression from Limes Lemons Oranges Citron Sorrel &c. When wanted for healing there should be evaporated to the consistence of Honey to prevent fermentation as they contain a mucilaginous and thick matter. It is apt to contract an empyreuma in evaporation unless the heat is gradual and gentle. Thus or Not is made in this manner and in order to prevent the empyreuma it would be better not to evaporate it to so thick a consistence and to add some

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some spirit which will prevent fermentation and will at the same time give it a grateful flavor.

The native acid unites with alkaline salts producing heat and effervescence with the vegetable alkali it forms the saline mixture. It has no attraction for the principle of inflammability. It unites with and dissolves absorbent earths. It dissolves Iron, Copper and Lead: we are directed from hence to be very cautious not to keep it in Copper vessels or with this metal it forms a compound very deleterious to the system. It does not act on vegetable or on animal substances. It exists in greatest abundance in summer fruit particularly before they are ripe for when they are ripe it is so enveloped in sugar as to prevent its action.

Of the Fermented acid

This is generally either acetic or tartarous. The acetic is generally diluted with water. The acetic acid is very easily and fully concentrated by means of congelation or by distillation from verdigris or by combining it with absorbent earths and then distilling it from them. By congelation vinegar may be very much concentrated thus 4 lb of it exposed to the Cold was reduced to 1 lb by 8 or 6ullen. And 8 lb of it exposed to a very severe frost for one night have been reduced to 2 Spoonfulls. The Cold must be 12° below the freezing point. This is a good way to concentrate it by freezing to reduce it to smaller bulk and render it more easily transportable.

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transportable. This was very strong and corrosive and little in-
ferior to the mineral acids. Its specific gravity differs but
little from that of water. It joins with alcohols forming
Neutral Salts; it also joins with earths (vid Cyllin) It has
little attraction for inflammables and unites neither
with ardent Spirits nor with oils. It checks fermentation
like all other acids and corrodes the metals. Particularly Lead
and Iron. with Lead it forms Sacchar. Saturni. It also
acts upon Copper and with it forms verdigris. It extracts
the virtues of mercury. It has but a small attraction for
water and makes but a slight impregnation on animal
and vegetable substances and extracts the virtues of
the latter but slowly except in some instances for exam-
ple with Squills with which it forms the Acetum
Sillitium.

Tartarous acid differs from the fermented acetous in
not being soluble in Spirits of wine. It also differs from
the acetous in not forming Sacchar. Saturni with
Lead and forming different compounds with the
alkaline Salts. It unites with alcohols producing
heat and effervescence. It unites ^{with} and dissolves cal-
careous earths and has but a slender attraction
for inflammable bodies. It dissolves Copper Lead
and Iron and has but a slight attraction for water.
Its action on animal and vegetable substances is
not remarkable. It requires 14 times its weight of wa-
ter to dissolve it. It contains an oily inflammable mat-
ter.

Tartar is deposited on the sides and Bot-
toms

* they are very weak they have some of the common properties of the other acids but differ from the other vegetable acids in this that they exist formally in vegetables cannot be extracted but by distillation whereas the others may be obtained by Expression or Fermentation

kins of wine Corks different wines deposit different quantities of it. Its color is either red or white according to the color of the wine. Rhenish wine deposits a great quantity of it and hence becomes old black. It is found in greater or smaller quantities in proportion to the goodness of the wine, thus rich old wines will afford very little whilst the thin and poor wines contain the most. Some low and thin wines are unimproved in most cases or they contain a large quantity of acid and or oil acids or sedative. It may be obtained by evaporating the Lees of wine. Tortor in its crude state is never used in medicine. The former way of preparing it was by boiling ^{dephlegmating} it in water and boiling it and skimming off the pellicle which from thence is called Crumenos tartari. The present method of preparing it is by dephlegmating it and suffering it to crystallize. The very best Linxar may be made by adding a little Tortor to the liquor which is to undergo the acetous fermentation.

Of the Distilled Acid

This has been but little wrought upon by the Chemists. It is sometimes produced from the different species of the Fir by distilling the chips &c. & is also extracted from stulies and from Tor. If the chips of the fir Tree are distilled they yield first water then an acid afterwards an essential oil then an

Empyreumatic



empyrenumatic oil. This may be obtained separately
either by uniting the vapors or by passing different vapors
to the mouth of the receiver: The acid should be after-
wards concentrated by subjecting it to a 2nd Distil-
lation. This acid renders in Tor and gives Tor water
its medicinal virtues. Tor but little dephlegmated and
abounding with impurities is best. Hence that
coming from Norway is better than American
Tor. From what we observe of the effects of Dead made
of Pine buds and of Tor water we are inclined to
think they have many medicinal virtues and
deserve many researches. This acid has the com-
mon properties of other acids viz. it unites with
alkalis absorbent and calcareous earths and
metallic substances. It may be concentrated by
evaporation but this is apt to give it as it gives
vinegar and Empyrenumatic Taste. Concentration
also concentrates it.

Mineral Acids

These are the Acid Ants the Acid of Bees and the acid
of urine or the Basis of Phosphorus. They form with
Lead Pechow. Salts which however is different from
that which is obtained by vinegar in parting from
the Lead in distillation without any change being
wrought upon it. It is unconcentrated by heat but if
this is strong it contracts an empyrenumatic taste
and



and odour. It forms oblong Crystals with vegetable
Alkalies, it unites with Volat: alkali and forms a
in aqueous sol. It dissolves all calcareous earths
but has no remarkable action on inflammables. It
dissolves the Colours of most metals particularly of D
and copper. It dissolves iron filings but has no ef-
fect on its Colours. It dissolves the Colours of Lead or
Minium, but has no effect on it in its metallic
state. It likewise dissolves Z with violence. It has
no effect on S or B.W.

Among inorganic acids we must mention one said
to be obtained from ants, those animals which have not one
by afforded an instruction upon Phosphorus but
were also used upon a field of enquiry for the ~~chem~~
chemist. This acid is a liquor rectified into certain bag
for a purpose not known. We may perceive it by the smell
if we turn up one Ant Hill in the Spring or Autumn. It
is ~~only~~ easily procured by distilling a quantity of ants
with water. Bees Wasp &c have this acid and some
have thought that by emitting some of it into the
wound the produced the pain that is caused by this
thing

The Acid of Urine when combined the ~~to~~ forms
Phosphorus. It is a native substance found in the
urine of animals. The effects of heat upon it are
not very remarkable. It unites with the vegetable
alkali and forms oblong Crystals. It is naturally
united

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united to volatile alkali. from which may be separated
by heat or it adheres but slightly differing from Com-
mon Sol ammon: It so strongly attracts fixed
alkalis that it decomposes common salt and ~~not~~
vitriolated Tarter to unite with their Bases. It unites
with Earths and has a strong attraction to In-
flammable substances. Tho its attraction for ~~So~~ is
very strong yet it soon and readily parts with it to
the air when exposed to it. The light and heat of
Phosphorus is owing to the ~~So~~ of the gradually
escaping. When diluted with two or 3 times its weight
of water it dissolves Zinc. It precipitates Regulus of anti-
mony, Silver, Iron, Copper, mercury and Bismuth
from the nitrous Acid and dissolves them. It pre-
cipitates iron from aqua Regia. The Phosphoric acid
dissolves iron ~~the~~ Zinc and Cobalt. It corrodes &
and slightly dissolves in water. It is obtained entirely
from the Urine of animals. From 20 Gallons of Urine
3w of this Salt has been obtained. It remains unchanged
by processes of the System and it is probable that it is a ve-
getable Salt as it is found in the greatest Quantity in
the Urine of those animals which feed on vegetables.
From hence we may understand why vegetables and
much greater power in the Secretory. The predominance
of the proximate volatile alkali in the System is the
proximate cause of Puerory and this occasions a
retardant disposition in the humors. Vegetable food
by



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by adding a quantity of this acid forms a neutral
Salt with the alkali (Sol animalis) which is thrown
out of the system by the excretions particularly by
Urine

The acid of Sedative Salt is obtained from Borax
It is a crystallizable salt but has not all the proper-
ties of an acid as it does not reddens the vegetable
Blues. With alkalis it forms salts capable of crys-
tallizing and dislodges the nitrous and muriatic acids
from their alkaline Bases. It unites readily with
Solcarious and Anglucous & other Acids, freely on
inflammable and metals and deposits slowly
in water. It is obtained from Borax by decomposition
or with the mineral acids by applying heat, or
by distillation. Sedative Salt has a bitter or well as
an acid taste.

Besides the acids already mentioned modern Chem-
ists have added many others among which is the acid
of Sugar which is extracted from all saccharine
plants, more particularly from the Sugar obtained from
the Sugar Cane. Nothing can be added to what Four-
croy has said on this substance (vid vol. 2^d p. 235)
We shall only mention that it is obtained from
Sugar by distillation with the unknown acid and
that its relation to Lime is so strong that it yields
to no other acid than the great use of Lime in
refining Sugar. The acids of arsenic, Antimony, Mer-
cury and Tungstemic have of late years
been



been added to the catalogue of acids together with
the acid of milk; the first four belong to the min-
eral kingdom the last to the animal.

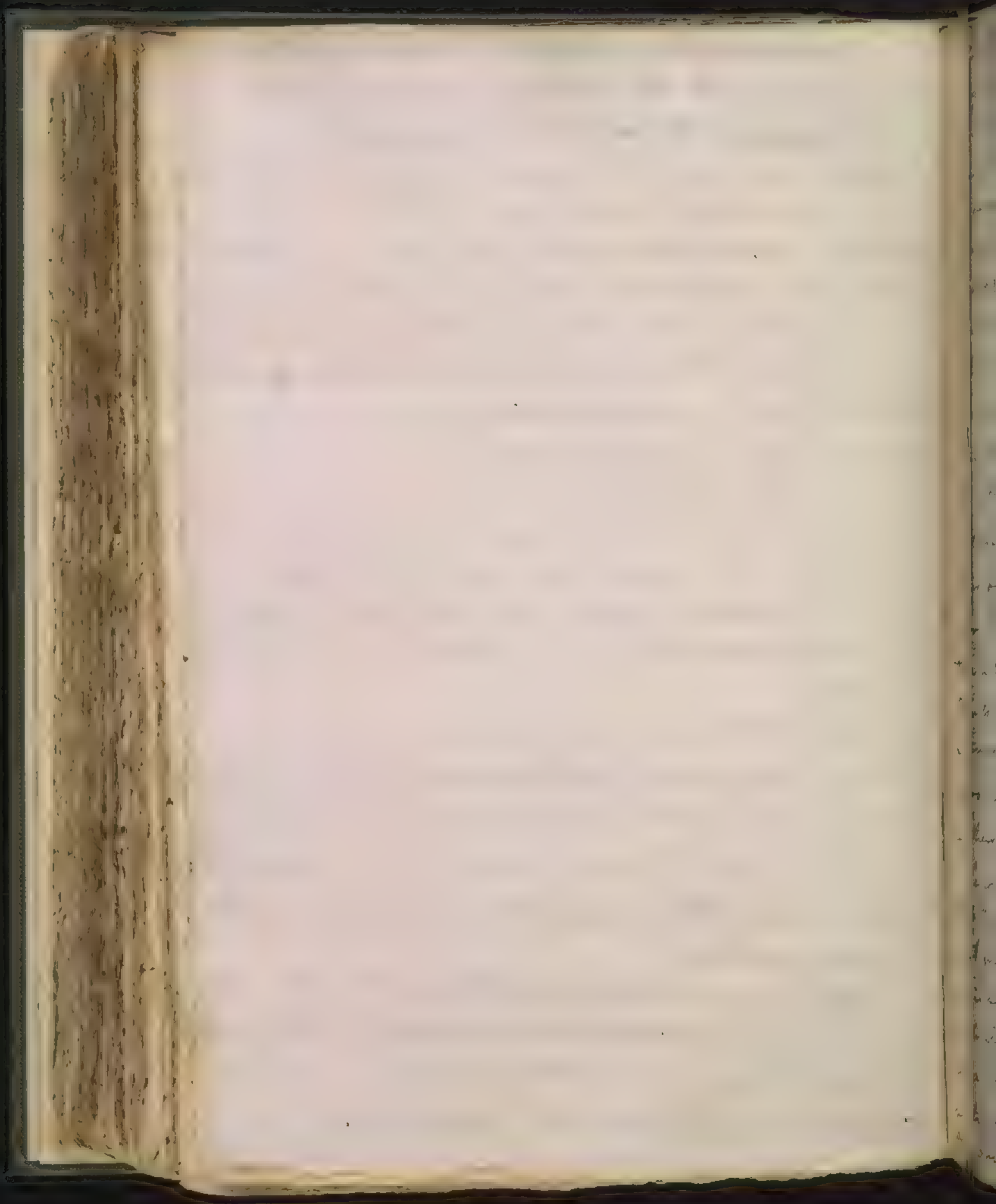
Before we discuss this subject of acids it will be pro-
per to observe that the celebrated Lavoisier imagined
that there was but one pure oxygen acid. That
all the acids we find in nature are but a many dif-
ferent modifications of it by the combination of
the substance. We must confess this opinion of
Lavoisier seems well founded and we are disposed
to think so as well as he did.

It is supposed that the vitriolic acid is compound
of this hydrogenic acid and a bituminous sub-
stance hence its strong attraction to the ϕ
that the Muriatic acid is formed by the addition
of metallic substances hence its strong attraction
to metals.

That the Nitrous and vegetable acids are formed
by the union of some vegetable substances with
that hydrogenic acid hence their attraction
to vegetable substances. Our opinion is strongly
strengthened by the circumstance of acids being changed
into one another.

We come now to speak of their application to
Medicine and shall first treat generally of them with
respect to the effects which they produce on the
animal system. They have been supposed to act as

Powerful



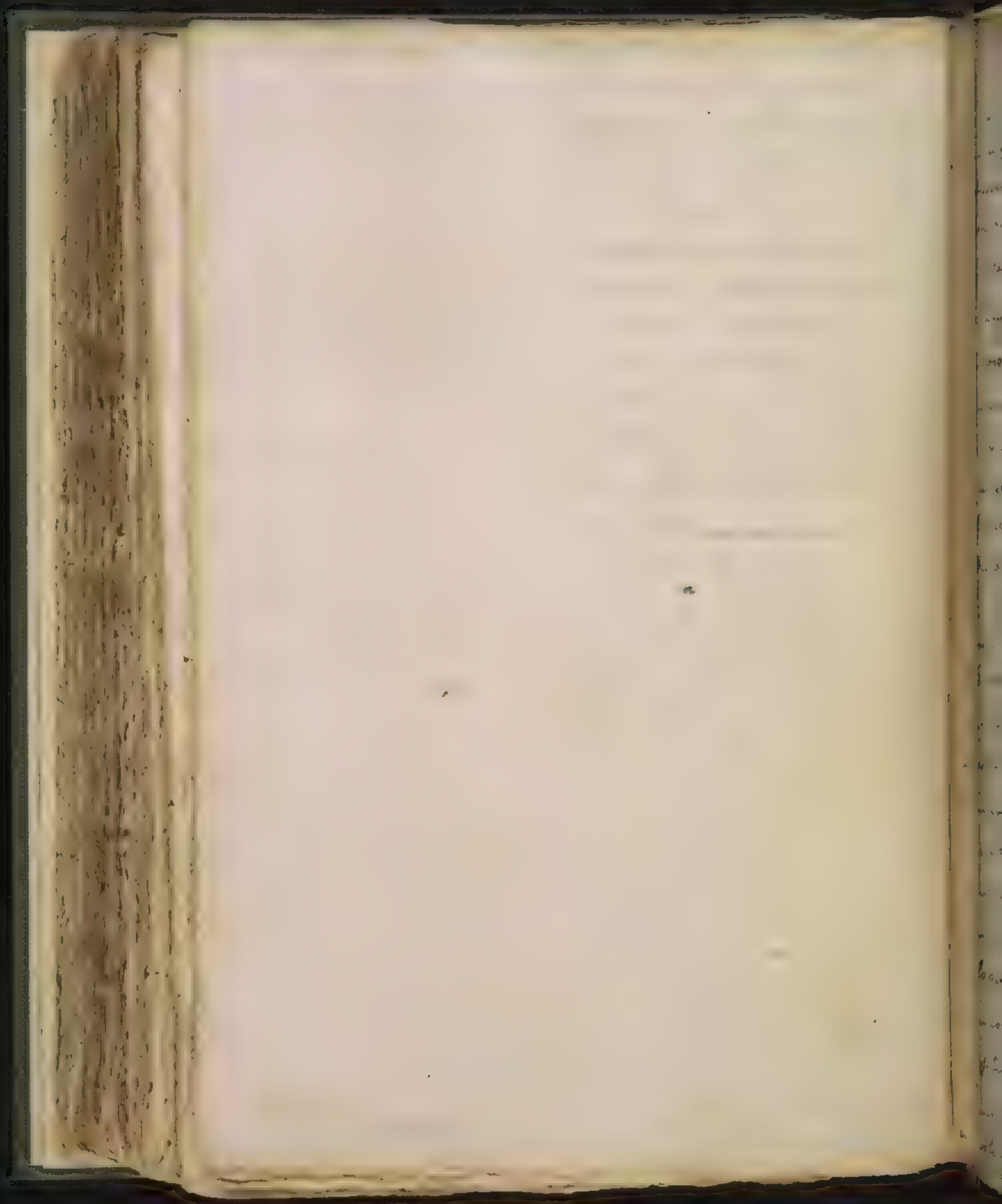


Conard.

The vegetable acids have been mentioned as one of them the native acid has been exhibited with considerable advantages in the Consumption, it should be taken in large quantities. Test'd acids are but little employed in medicines they might however be employed with advantage in Rheumatic Gouts.

For water the Tor Pils and Pine Budd Test'd (all in - as their virtues is an acid) have been found to arrive in these Gouts. To them may be added the acid distilled from Pine Shingles. With these acids a Quantity of oil is combined which renders ^{diminishes} ~~increases~~ than increases their virtues. The animal acids have never been used in medicine.

From what has been said then appears to be proper in an inflammation, discharges of the system &c. More mercurials proper being employed with advantage in the Consumption.



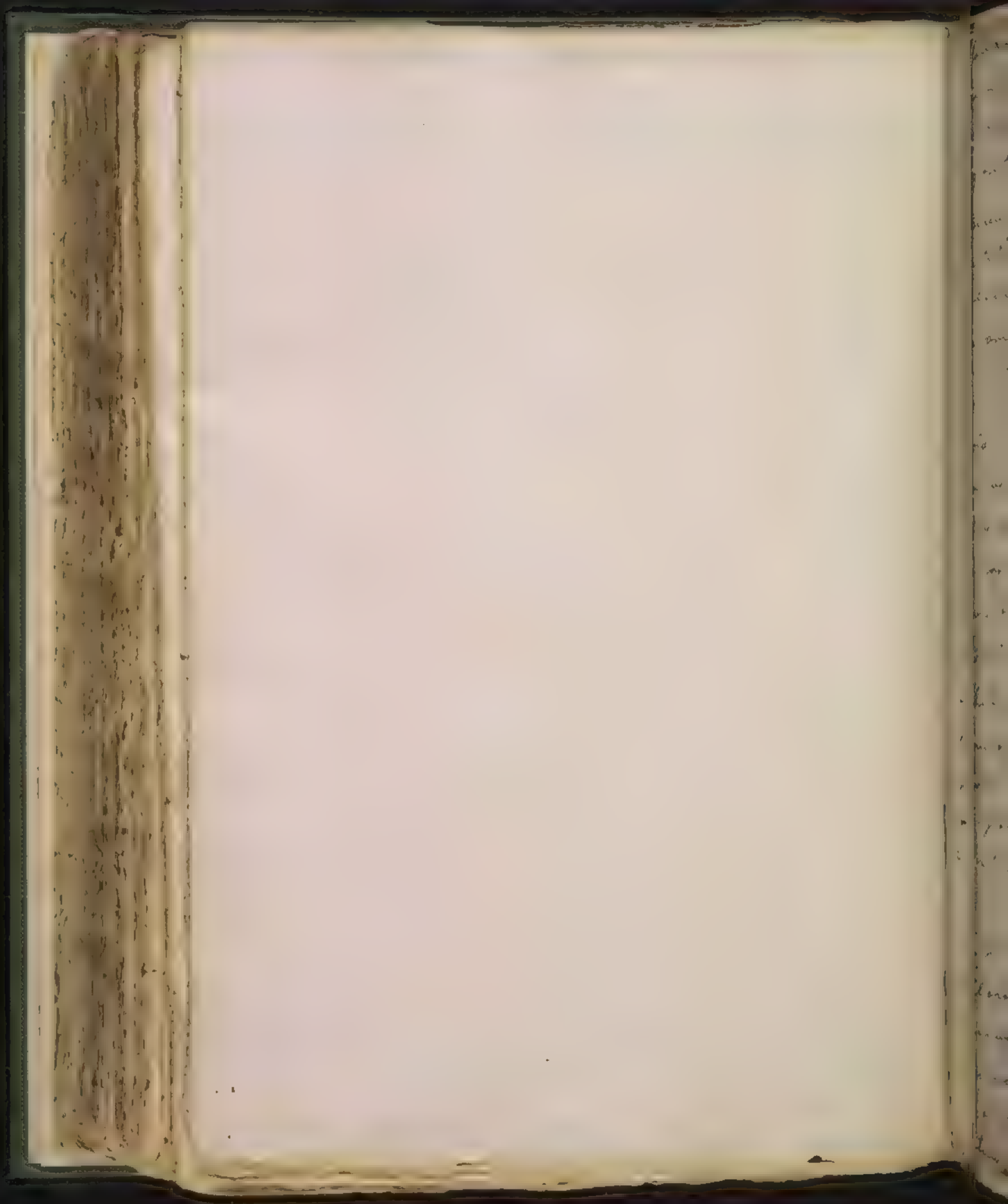
Of the Alkaline Salts

We now come to treat of alkalies and shall first speak of them in general and then of each in particular. It may be observed of alkalies in general that 1st They impart a fiery acid Taste by some called urinous 2nd They are very detergent cleaning off impurities from the skin 3rd They change the Rubea syrup of violets or any other blue vegetable infusion to a green Color 4th They effervesce with acids if not deprived of their fixed air 5th They unite with Sulphur forming the gas Sulphureous and with oils forming Soap.

Alkaline Salts are divided into Fixed and Volatile. The Fixed are subdivided in Fossil and Vegetable.

Fossil alkali

This is a native substance found found in some of the Eastern parts of the world particularly in Egypt. It is called by Phrygians natron and is spoken of by Solomon under the name of nitre. It is often found combined with the urimatic acid forming common salt or with the acid of Borax forming Borax. It is sometimes found combined with the vitrolic acid forming green salt from which it may be separated by deflagration with charcoal. It may be obtained from common salt: It was first procured by the Egyptians from the sea plant called Kali from whence it gets its name. It was for a long time undistinguished from the vegetable alkali; but

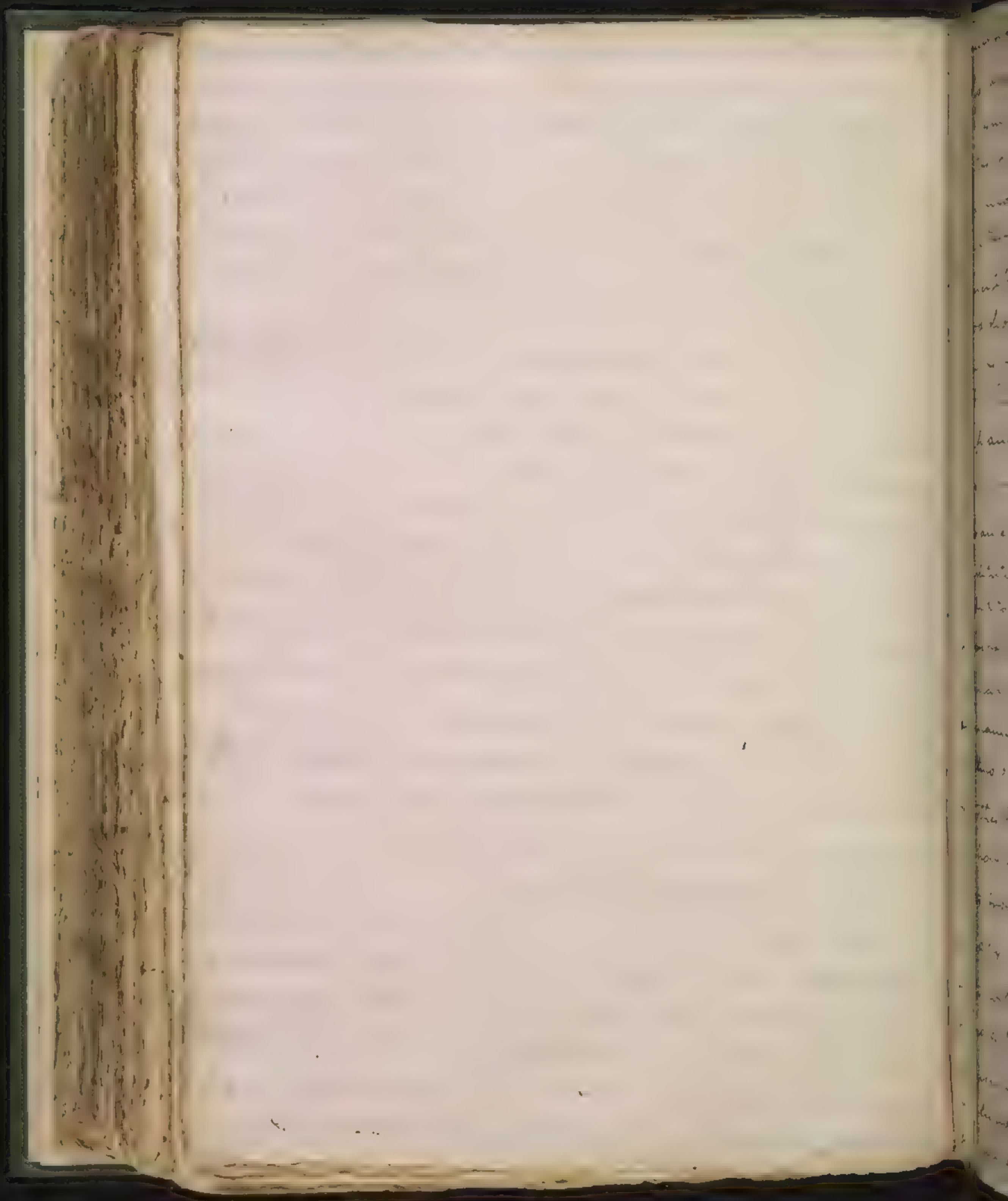


all late authors have agreed in pronouncing a difference between them. The French and Spaniards often the Egyptians procured it from some plants growing on the Mediterranean sea shore. It is also obtained in Great Britain from ~~other~~ almost all the plants that grow on the sea shore. Some plants producing it grow about Cape Henlopen in the Delaware State.

This salt is exposed to a great degree of heat runs in fumes, which again condense on the admission of cold. The properties of the Fixed Alkali are nearly similar to those of the vegetable but differ in many respects. The Fixed Alkali crystallizes like a neutral salt. It does not like the vegetable alkali grow moist in the air, but carries with it some of its moisture in a dry air by which means its crystals lose their transparency become as it were mealy and fall into a fine powder. Its form likewise differs. A Neutral salt (see Syllabus) joins with acids like Sulphuric acid six times its Quantity dissolves.

Vegetable Alkali

In taste of this is more acid and fiery than the Fixed alkali. It is only obtained from vegetable substances by means of burning them. It may be obtained from tartar by calcining it in downward, it may also be obtained from nitre by calcining & displacing it with charcoal. The vegetable alkali



names from which this alkali is obtained is of 2 kinds
1st Vegetable Substances in their natural state

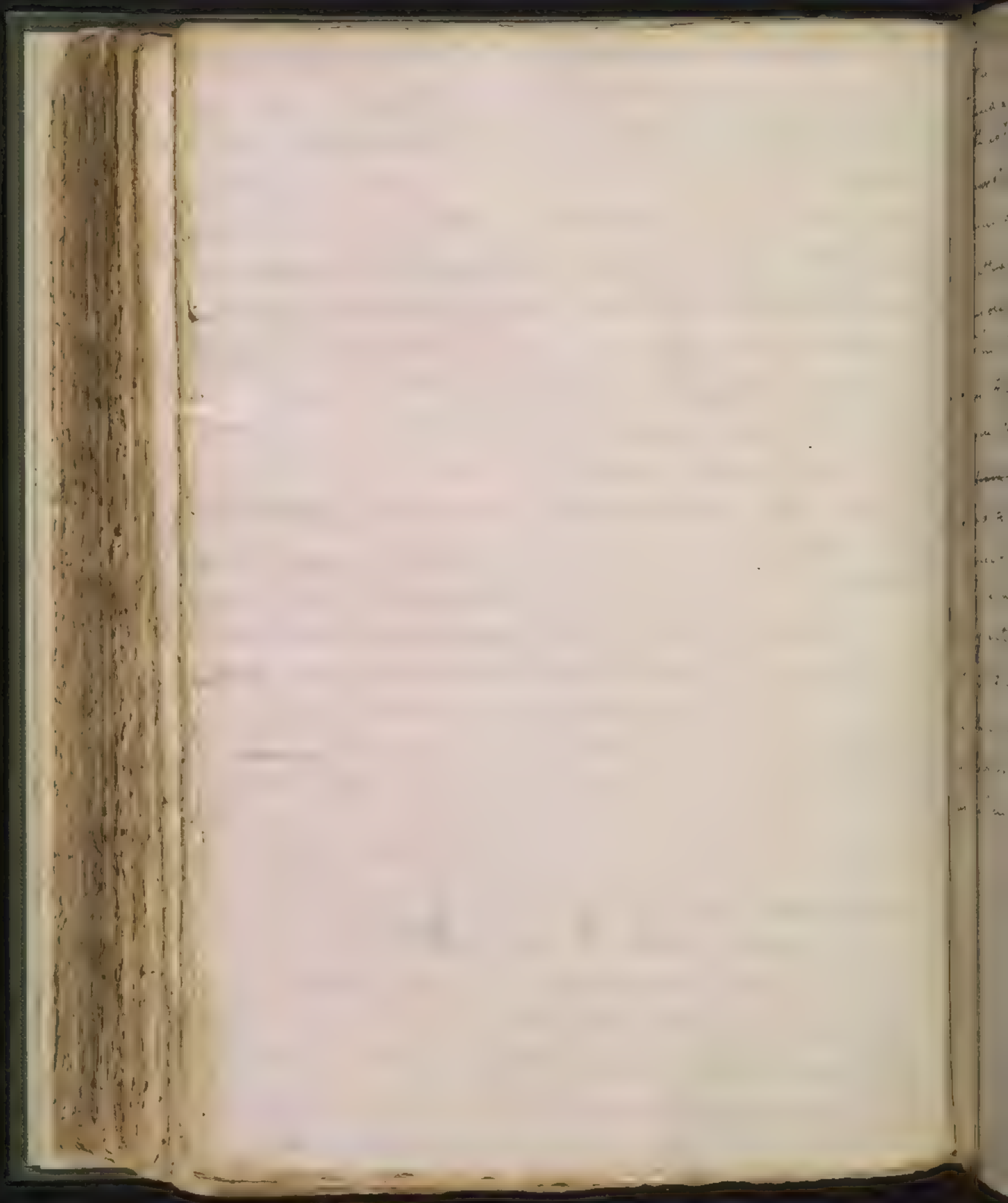
2nd Fermented vegetable Substances or that of Tartar
which produces the fixed kind

It is most advantageously obtained from ^{hard} wood
which they are green for when ~~are~~ they lose some of their
principles by the inclemency of the weather. The
Wood should be burnt to ashes not in an open fire
entirely but somewhat covered or in an iron
pot. The ashes themselves are used in making
soap and in bleaching - soap makers make a ley
of ashes which they boil untill it is strong enough to
bear an egg and then add the oil or fat which
constitutes soap. The water should be cold when
added to the ashes & it may not dissolve the vit-
riolated tartar contained in them. It may
be made almost white by burning and then setting
in a container by that which has the live coals in it and
putting one end of a bag in one and the other end in
the other container it will answer in end of a syphon
during evaporation & carrying the juices
out from the live coals. It is rendered more
acid by burning. Joined with all acids they
unite with effervescence untill the alkali be de-
prived of its fixed air and when so they unite with
effervescence. For the Neutral Salt formed by this
combustion & on melting the Syllabus) Upon add-
ing an acid to our alkali a neutral salt is
formed



formed and on instance of single elective attraction
whereas as the acid has a greater attraction for
the alkali than the fixed air or the aerial acid
has for either, a decomposition occurs and the
latter escapes from the alkali with which it is com-
bined. This is proved by weighing the substance
before and after mixture and we shall find that
weight considerably diminished. Half an ounce of
the salt of tartar by the addition of the vitriolic acid
will lose 3j in weight. If 1 part of quicklime be ad-
ded to 3 parts of this alkali the lime becomes mild
It unites with all the earths rendering neutral of their
fierce. It unites with oils forming soap and
with those more readily when caustic: with sulphur
forming Hepor Sulphuris. It unites with spirit of wine
when caustic. It unites with metals promoting their
fusion and by means thereof all earths may be
integrated. It dissolves concretions ~~and~~ It dissolves
lead and antimony in their metallic state. It also
dissolves mercury and hence it is useful in moderating
the too great secretion and operation of this fluid in
a gonorrhoea. Good may be made to dissolve in
water means of the Hepor Sulphuris. Hence
he concludes that Moses employed it in his
process on the golden calf.

The Causticity of this salt arises from its being
superior of its fixed air which is an approximate
its



its power, and thus renders it caustic. Calcination will
do this or the addition of any substance deprived of
its fixed air or Limestone &c. This alkali is the same
with the pot ash which is made in great quantities the
manner of carrying on the Process is well known. It dephos-
phorises in an equal quantity of water and has such
an attraction to it that it deliquesces in the air and
forms oleum Tartari per deliquium.

This salt corrodes animal and vegetable mat-
ter. It is known its attraction to oily substances and
may be its use in bleaching. It is extremely useful
in bleaching taking films from the eyes or it is
found to corrode and destroy inorganic sooner than
organic substances.

Gold and Silver lace may be prevented from
being entirely useless when they are old and defaced by
this if it is in a caustic state for it dephosphorises the silk
which is an animal substance and leaves the
gold or silver behind. When in its mild state it
is useful in cleaning soiled gold and silver lace.

These salts are easily decomposed by either of the fixed
alkalies. It has but a slender attraction for Earthy Sub.

Of the Volatile alkali

The volatile alkali possesses all the properties of all other alkalis with regard to its relation to acids and in turning the lye of violet green: but the effects of heat and moisture on it are different. It is more volatile and possesses more acrimony. By heat it is converted into vapor which being exposed to cold concretes and gives us what is called volatile salts. It is more acid than the other alkalis and also differs from them in having its vaporific point below its point of fluidity whereas they cannot be converted into vapor when combined with the acids it forms different neutral salts (vid: sylt.) It is more ammoniacal explodes with a certain degree of heat. It unites with most inflammables with sulphur it forms Sulfur Sulphuris. It readily combines with essential oils forming Essences de Luce. With expressed oils it forms a warm kind of soap. Spirit of wine precipitates this salt from water by a single elective attraction. It unites with several of the metals in their calcined state and precipitates Copper from acids uniting with it forming Cuprum ammoniacum of a blue color. It readily dissolves in water and forms crystals generally dissolving if in its mild state but heat of fire is destructive. It does not act so powerfully on animal and vegetable substances as the other alkalis because it is so volatile, which prevents its being continued for a long time. It may be procured from animal substances.



Substances by putrefaction of which it is the pro-
duct and is found in quantities in Stables among the
Dung. It may be milled in Stables where dung is turned
up after laying some time. Hence Physicians have re-
commended this patients laboring under disorders of
the lungs to make use of the odor arising therefrom
and some advantages from the custom but if they had
understood that the virtues of the dung depended on the
volatile alkali it contained they might have chosen a
more elegant and agreeable method of producing the same effect. If the vitriolic nitrous or
muratic acids be exposed to this vapor neutral am-
moniacal salts will be formed. It may also be ob-
tained from animal substances by distillation. It is of
no consequence what parts of the animal are made
use of. The Horns Hoofs and Horns &c. are most gene-
rally subjected to this process. Thus the salt extracted
from Hartshorn is most common and is called Salt
of Hartshorn. The Naturalists have long disputed with
regard to some particular substances whether they be
conjoined to the vegetable or animal kingdom. There
was here stepped in and untied the ~~the~~ Knot.
The only firm Criterion to judge by is the product
they yield when subjected to distillation. Animal
substances upon distillation always give out a
volatile



volatile alkali and vegetable a fixed But the vola-
tile alkali is most universally obtained by the
chemists for the purpose of oil from Sal ammon.
this is decomposed by adding fixed alkali or cal-
careous earth or metals when a mild fixed al-
kali is used, we obtain in volatile alkali $\frac{2}{3}$ or even
 $\frac{3}{4}$ of the weight of the Sal ammoniac this is owing
to the fixed alkali imparting its fixed oil to the
volatile alkali. Du Hamel and Macquer amount-
ed to this increase of weight by supposing that
part of the fixed alkali being volatilized, but this we
now know is not the case. If we use unslacked lime or
lime in its mild state the product of volatile alkali in-
creases and is more remarkable, if 3 Pounds of
lime in this state is added to ~~a pint~~ $\frac{1}{2}$ lb of Sal am-
mon. we obtain an equal quantity of volatile
salt viz $\frac{1}{2}$ lb. If we add quicklime (or lime deprived of
its fixed oil) no such remarkable effects are observed. A
thin virus ~~is~~ in a fluid form remarkably cor-
rosive and in this case not more than $\frac{1}{2}$ lb of volat-
ile salt will be obtained from $\frac{1}{2}$ lb of Sal ammon.
The volatile salt in this country or that which
comes from England is obtained from by means
of chalk hence its beautiful white color.

We have now finished the condensation of
on particular alkalis and shall be distinguished
the



The subject makes ~~some~~ some few reflections upon these sub-
stances in general and then attend to their application to
medicine. We shall make the same observation on alkali
as we did before on acids in our former Lecture, viz that it
is probable that there is but one homogeneous alkali
in nature and that different kinds are owing to the
combination of this primitive one with various sub-
stances for example the fixed alkali is rational to
suppose owes its peculiar properties to its being com-
bined with some humours substances the vegeta-
ble to its union with vegetable substances and that
the distinguishing characteristics of the volatile alkali
may be accounted for from its combination with
a fine matter containing the ϕ . What we
from this notion is that they have been actually
changed into each other e.g. The fixed alkali has been
changed into the volatile. Thus by collecting the
juncus proimud by the dephlegmation of nitre and
Hepar Sulphuris they will be found to contain
volatile alkali. Struck tartar if digested in the
oil of wine will be found to be converted into
nitric ammon. The fixed alkali being converted
into a volatile and probably from attracting the
principle of inflammability. We now come to
their application to medicine. They have been
long supposed to have been powerful reptic and
Auchan



Huchon supports this opinion and thinks they produce
a putrefaction in the blood he relates some cases in which
he thinks they acted in this manner. Some on the
contrary assert that they are antiseptics, but here we
must remark that it does not follow that because they
are antiseptic out of the body that they are equally so in
it. They may from their strong stimulus on the fibres
in the system produce a diseased state of the blood
unlike to putrefaction which might perhaps be more
properly termed dyscrasia. They have also gained great
credit in curing calculous complaints especially if con-
sidered a little caustic: but here if they do dissolve the
calculi in the kidneys and bladder it cannot be
from their chemical action or they could not exist
formally or in their natural state in the blood, in
the stomach they must necessarily be neutralized
by the acid prevailing there or even if this was
not the case they could not pass the extremely sen-
sible lacteals which contract upon any acid sub-
stance coming in contact with them in their na-
tural state or if this was possible they must be much
diluted in the blood so as to become entirely mild
and incapable of exerting any effects. I do not deny
that calculous complaints have been cured by them
it is probable they may act first by rendering changing
the state of the kidneys and rendering the urine a sol-
vent of the calculi, when with the particles of gravel or
stone are discharged during their use it appears.

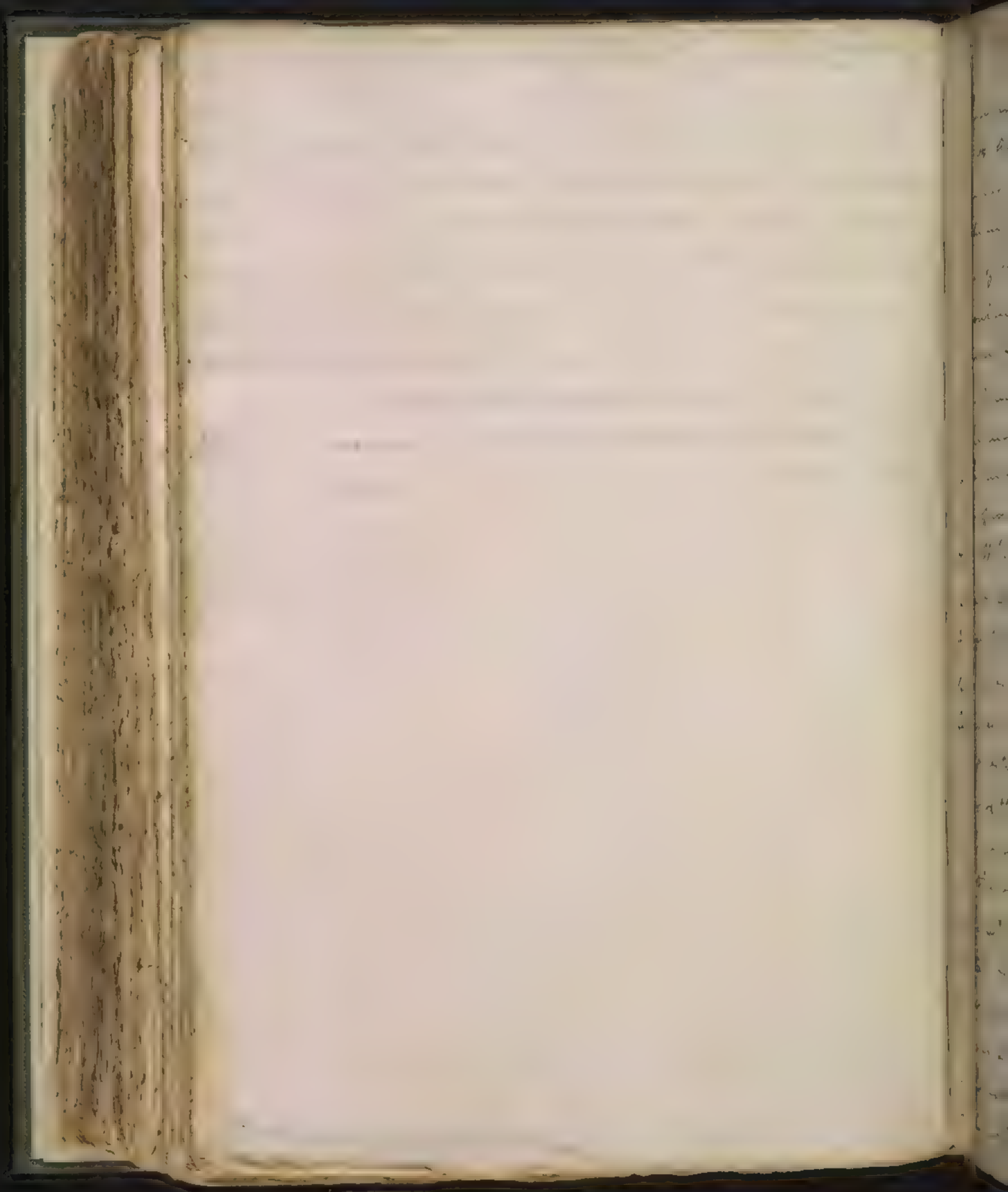


owing to this circumstance. 2nd by rendering the
Kidneys and Bladder inimical to the humors of
the Calculus will existing. Dr Hunter used to tell us in
his Lectures that a stone was found in the Bladder
of that very person for the supposed cure of whom Mr
Atkins had received 5000 Guineas, and De Haen re-
marks that Stones have been frequently found in persons
who had imagined themselves perfectly cured. 3rd perhaps
the good effects of alkalis is owing in these cases to their sup-
plying the defect of alkali in the animal juices and de-
stroying the vegetable acid existing there. In support of this
it is observed that more persons affected with Calculous
complaints who live on animal ~~than~~ vegetable than
animal food, and there are a greater number of pa-
tients in the infirmary of Edinburgh laboring under
this disorder than in any other part of Great Britain and
it is remarked that they in general come from the
Highlands of Scotland where the inhabitants live
almost solely on vegetable food. They have also been
used as sudorifics but they act only as neutral salts
being neutralized by the acid in the Stomach.
But if there is not a sufficient quantity of acid
in the stomach to saturate them perfectly, they
will prove heating and stimulating and should
never be used in this intention. There is
an instance of the effects of poison being obviated by
^{at volat} alkali mentioned by Mr Wilson in his memoirs.



of the Royal Academy of Sciences, & 'maître de médecine' and
by gathering plants for the improvement of his knowledge
in Botany unexpectably been poisoned, but by the frequent
and skilful use of the volatile alkali the bad consequences
which would otherwise have followed were obviated
and he cured. In this case it acted as a stimulant on the
nervous system. Since that time the volatile alk. has
been much used in France in all hysterical cases
which attack and produce their effects suddenly.
This shows the close analogy between poisons and the
miasmata producing putrid disorders.

Neutral or Compound salts

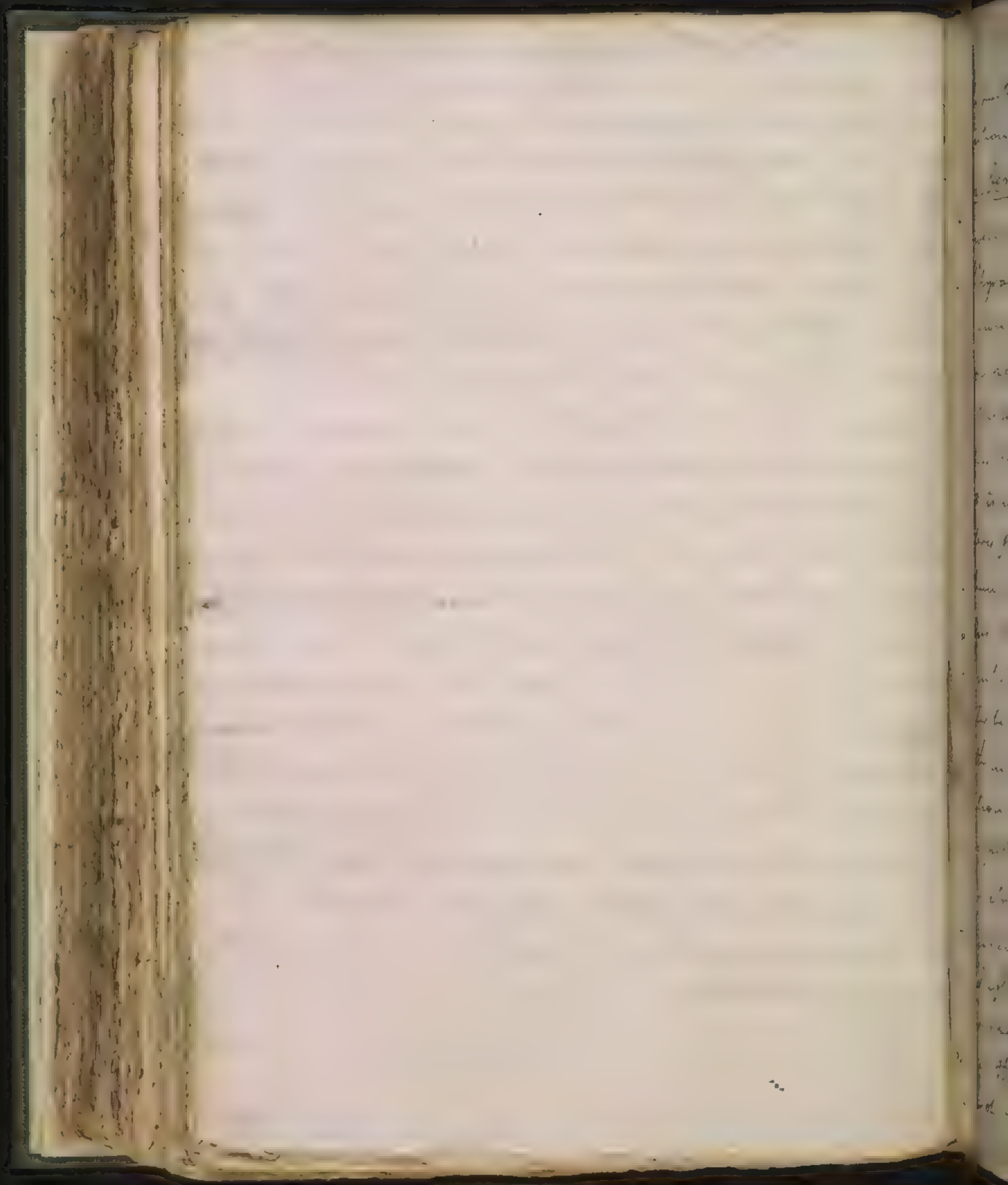


Neutral or Compound Salts

These are formed by the union of two simple salts viz. acids and alkalis and they possess / possess the peculiar properties of neither after combination but form a tertium quid and hence are called neutral. The catalogue of them has been very large owing to the various names given them by authors which have been imposed by the ignorant to be distinct species. This number is limited. A neutral salt cannot be produced by the mixture of an acid and an acid or an alkali with an alkali moreover they are neutral in no state of combination except that of saturation. When a neutral salt is formed the acid and alkali are respectively saturated, this is called the point of saturation and is extremely hard generally to determine. The denomination or naming of effervescence has been generally thought a test but it is not a certain one because the particles are frequently beyond the sphere of each others attraction. Agitation will in some measure obviate this inconvenience but the vessels in which neutral salts are made cannot always be agitated for. If the alkali is in a constant state or deprived of fixed air on which this effervescence depends it will wear long before saturation. There is a better criterion and will help us a good deal but this is not sufficient or tastes run into and hence with each other like shades in colors and pointing the



Best method of them appears to be this viz dipping a
piece of paper tinged with the Symp of violets into the
mixture if it is changed red or green it is plain that
the acid or the alkali prevails. It is necessary that
the paper should not be discolored in the least by
the mixture saturated. It is not necessary to be so
accurate in all salts. In those made with the vo-
latile alkali, if this prevails it will soon fly off in
vapor. The acids will likewise separate in crystal-
lization of the salt. They are also often formed in this
manner naturally and are not always artificial.
Neutral salts differ from acids or alkalis in the fol-
lowing particulars 1st they possess but little Acvi-
nity 2nd they have but a slender attraction for
minerals 3rd They act but feebly on metals.
4th They have a very weak attraction for water and
suffer water to evaporate from them. The Compound
salts are limited to 18 16 of which are set down in
a table (vid Symp) Some have supposed that the
acid and alkali lose their original properties by
being combined with each other. But this is not
the case or when disunited they regain all their
former properties.



1. The Compound or Neutral Salts

The particular neutral salts next demand our attention of these we shall first speak of Glauber's salt. Glauber's Salt is compound of the fossil alkali and vitriolic acid. The figures of its crystals are hexagonal pyramidal with two obtuse angles. It undergoes spontaneous calcination when exposed to the air on account of its little attraction for moisture and this seems to be the best test of its goodness. It is further known by a bitter disagreeable taste. By heat its water is dissipated and it undergoes a watery fusion its crystals contains half of water in them. It suffers no change from acids and alkalis. It has no remarkable effects upon earthy substances. If a solution of Glauber's salt in water be added to a solution of calcareous earth in the nitrous acid a double elective attraction takes place. The nitrous acid unites with the fossil alkali of the Glauber salt forming marine nitre while the vitriolic acid unites with the calcareous earth and forms sulphuric. Of the inflammable substances it acts chiefly on charcoal. If it is deflagrated with this mixture the vitriolic acid uniting with the principle of inflammability and forms sulphuric, this



this uniting with the fixed alkali forms impure sal-
lureis which may be decomposed by any acid.
the vegetable is generally used - this is afterwards
to be separated by heat and the fixed alkali ob-
tained pure. Beaume tells us he decomposed
glassers salt by a strongly concentrated

acid acts only from the Li it contains. It does
not act upon metals in their native state but
precipitates some of them from their solvents by
means of double elective attraction. The vitriol
acid unites with the metal and the alkali with
the acid in which it was dissolved. It has but
little action on animal or vegetable substances.
It dissolves readily in water and provided it be heat-
ed it can be dissolved in an equal quantity.
When the water grows cold this salt will be
deposited in beautiful transparent crystals.
The transparency of these crystals depends on
the water they contain.

origin. It is generally an artificial substance tho
sometimes found in a native state in plants in
brick walls and in some mineral waters.
It was formerly obtained by decomposing com-
mon salt by the vitriolic acid this was the me-
thod used by glassers from whom this salt de-
rived its name. It may also be obtained by steam
distilling



posing Sal Arbellens or Borax by means of the Vitriol
and it is generally procured by mixing the
pure vitriolic acid with the pure fixed alkali obtain-
ed from Kelp. This method was first recommended by
a Society in London.

Vitriolated Tartar is composed of the vitriolic acid
and the fixed vegetable alkali or Salt of Tartar. Its
crystals are four sided columns which go off at right
angles and end in pyramids. It contains six water
than Glauber's Salt of course is less transparent it
does not undergo a watery fusion and the effects of
heat are not remarkable on it. It is not changed
by any acid or alkalis. It has no considerable action
on earthy Bodies. It has the same attraction for
inflammable substances or Glauber's Salt, nei-
ther has it any action on metallic substances in
their natural state. If vitriolated tartar be added
to a solution of silver in the nitrous acid it is
decomposed and a double elective attraction takes
place. The vitriol. acid leaves the alkali and unites
with the silver and the vegetable alkali forms with
the ~~very~~ nitrous acid Nitre. Lavoisier & Berthollet
blamed the decomposition of vitriol and Tartar
in the hands of the chemists. The method he used was
the one just mentioned. Vitriolated tartar is very
difficult of solution in water, it requires 16 times
its weight of heated water to dissolve it and it has
no

Vitriolic ammoniac



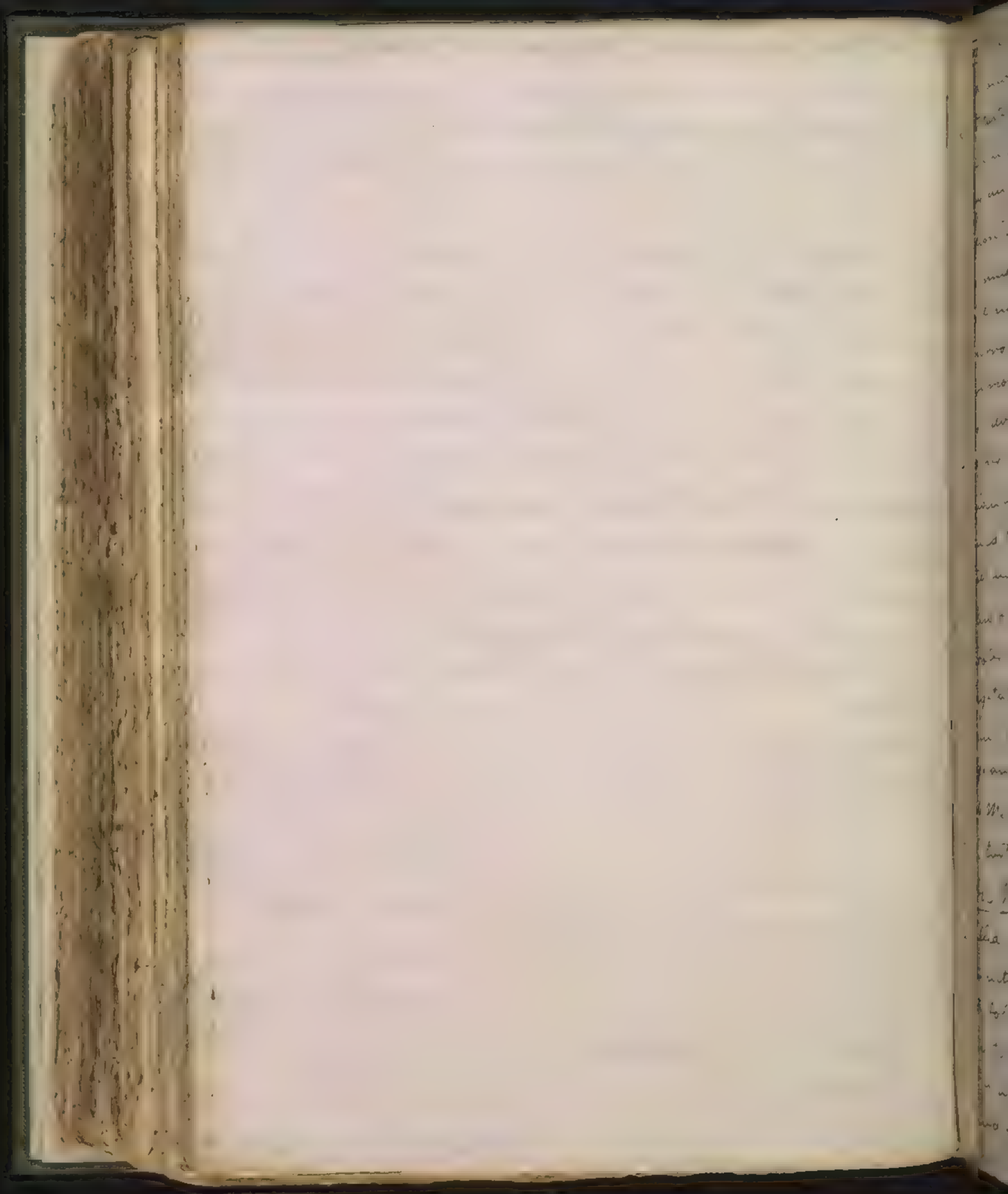
no action on animal or vegetable substances. —

Origin. It is sometimes found in a native state in the juices of plants and vegetables alkali or Potash has generally some portion of it adhering to it. But it is mostly an artificial substance and is obtained 4 ways viz. 1st by adding the acid and alkali in their separate states unmixed. 2nd by adding the acid in separate to the alkali in a compound state. 3rd by adding the acid in a compound state to the alkali in a separate state. 4th By making use of the nitric acid and vegetable alkali both in their compound states. The first and fourth of these methods are seldom employed as they are expensive and troublesome. The 2nd and 3rd methods are generally used in forming this salt.

Table of the combination of Nitric Acid & Potash

| Acid | Alkali |
|---------------------------------|-------------------------|
| 1 st Nitric Acid | Vegetable Alkali |
| 2 nd Nitric acid | Neutrals of Veg Alkali |
| | Comp. of veg alkali |
| | Rep. of veg alk |
| 3 rd Nitric ammoniac | Vegetable alkali |
| Nitric | |
| Acids combined with | |
| Sulphur | |
| 4 th Nitric ammon. | Neutrals of veg. Alkali |
| Nitric | |
| Acids combined with | |
| Sulphur | Nitric |

Nitric ammoniac



Vitriolic Ammoniac. composed of the vitriolic
acid and volatile alkali. It possesses a penetrating pen-
etrant taste and smell and remains unchanged in the receiv-
ers when heat is applied. It is not decomposed or acted
on by any acid but the fossil or vegetable alkali de-
composes it. It has little or no action on the earth in
this simple state, neither can charcoal decompose it or
it will not bear heat it quickly evaporates. It acts upon
and corrodes or dissolves all those metals all those that
the vitriolic acid acts upon in a separate state. It dissolves
silver, Iron Zinc Lead and tin and when added
to copper elevates it in the receiver; hence it was called
by Glauber the Eagle salt. The vitriolic acid he
named the talons with which it seized upon the
metals and the volatile alk. the wings with which
it flew over into the receiver. It dissolves readily
in water and produces cold. If this solution stands
it vegetates and effloresces.

Origin. It is never produced by nature but is al-
ways an artificial substance and obtained by
the 4 Methods that are made use of to obtain vit-
riol. tartar nutritis mundis.

Cubic Nitre. This neutral salt is not proper ly
called, its crystals are Rhomboidal. It is formed
of the nitrous acid and fossil alkali. Its fusibility
and solubility is nearly the same with common
nature to be shaken of merit.

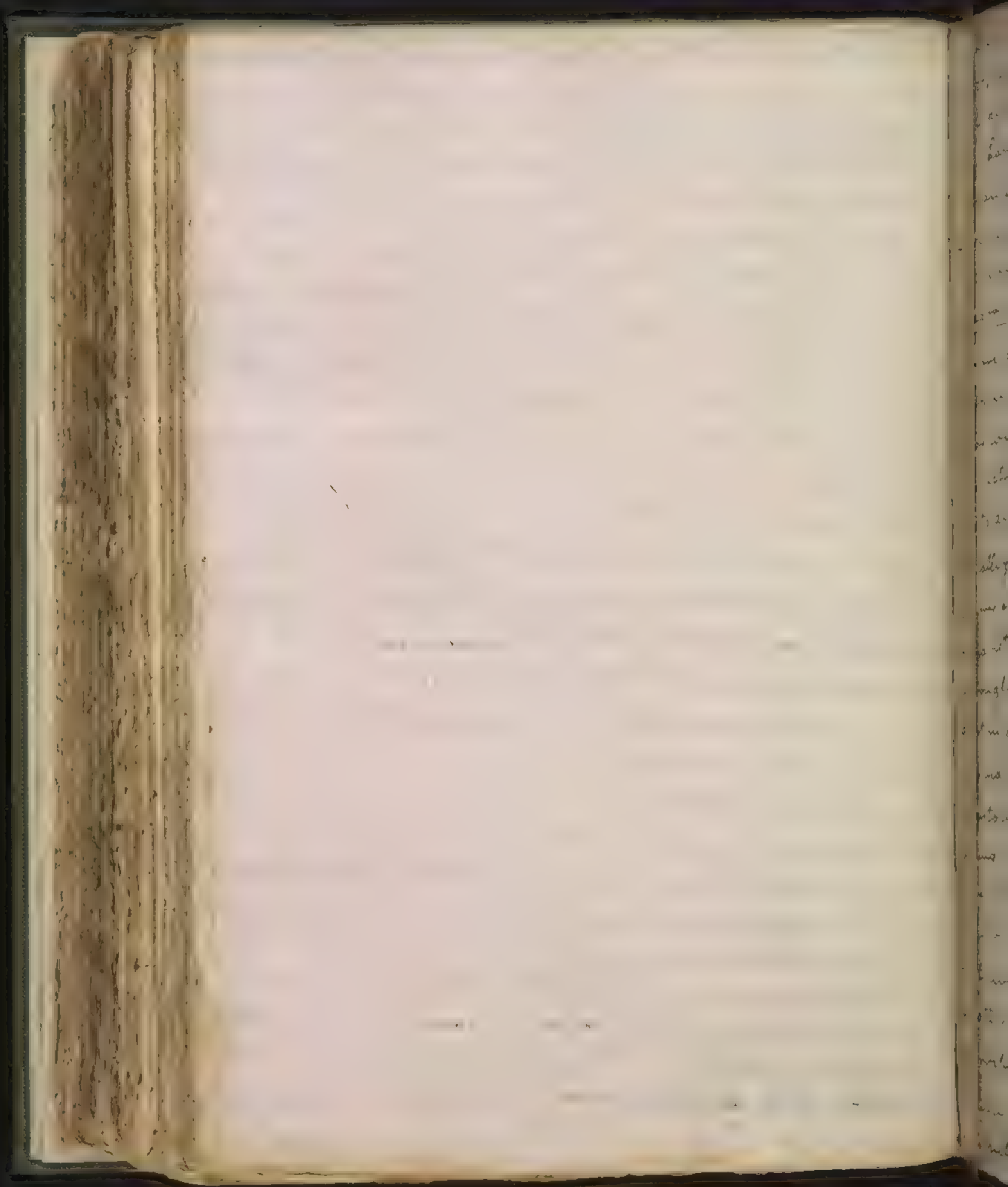
It is seldom found natural. In Germany it is
found united with the fossil alkali. We suppose

Cubic

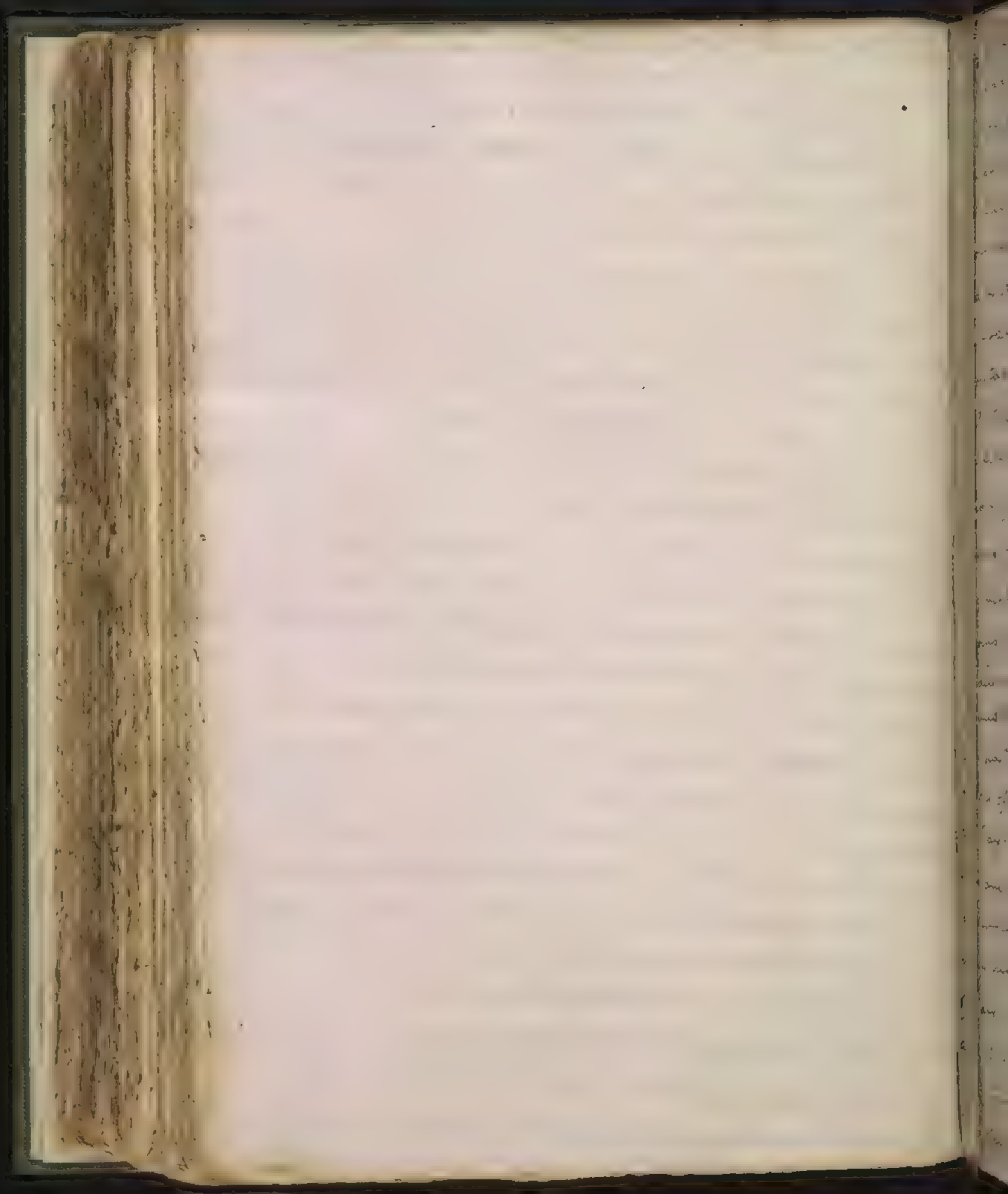


nitric nitre is formed in the earth where it is found
native in a kind of earth in Virginia. The sun's rays in
its descent must meet with a combustible matter
in the nitrous acid generated on the surface of
the earth by putrefaction at various luminous mat-
ters it is converted into a weak nitric acid and in
its descent meeting with fossil alkali it forms united
the nitric Glauber's salt. There are 4 methods
of obtaining this or in the foregoing
it may be obtained by a process without distillation
by adding the Common salt to the Lunar tartar
in this a double elective attraction takes place and
the nitrous acid in the Lunar tartar seizes on
the fossil alkali and is crystallized forming Gu-
ber nitre. It is a solution of Glauber's salt in water
add chalk dissolved in the nitrous acid and a few
units will be precipitated while a Guber nitre is
formed. In its properties it more greatly resembles
the common nitre.

COMMON NITRIC HNO_3 is a composition of nitrous
acid and fixed vegetable alkali. Its crystals are
white and of an irregular figured 6 sides or hexagonal
shape. It is supposed to be most pure when it is most
white and polished in its appearance. It melts in a
moderate degree of heat less than that of red heat.
Its fusion does not depend on the quantity of water
it contains but upon the same principles as that
of metals. It is decomposed by no alkali and by



no acid except the vitriolic. It has been employed to burn
bothers but we suppose that in this process the acid is un-
likely dissipated and that it acts solely by its alkali. The
characteristic of nitre is its strong attraction to all
substances containing the principle of inflammability
when placed in contact with them in an inflamed
state it occasions a sparkling kind of noise called
deflagration with a white flame. When sulphur &
nitre are deflagrated together and afterwards washed
they form the Sal. polyphosphoric. This is a vitriolated
tartar combined with Hepar Sulphuris. Sal. pernitric
is nitre deflagrated with a small quantity of sulphur
then to dissipate its impurities. But solution and
crystallization will answer better for this. But the
nitre never acts upon inflammable bodies till one or both
are red hot. This depends either upon the acid adhering
so strongly to its alkaline basis as not to be separated
except in a red heat or from the power of not acting
unless red hot. Nitre serves to show us the presence of
phlogiston and is the basis of our fulminating ore-
blasting powder and is the chief ingredient
that enters into the composition of gunpowder. The
invention of gunpowder may strictly speaking be
said to have made more noise in the world than
any other substance whatever; and tho it may excite
its terrible ideas yet upon the whole in its effects it
has been beneficial to mankind. Since the use
of this substance was how long ^{destructive} ~~long~~
then.

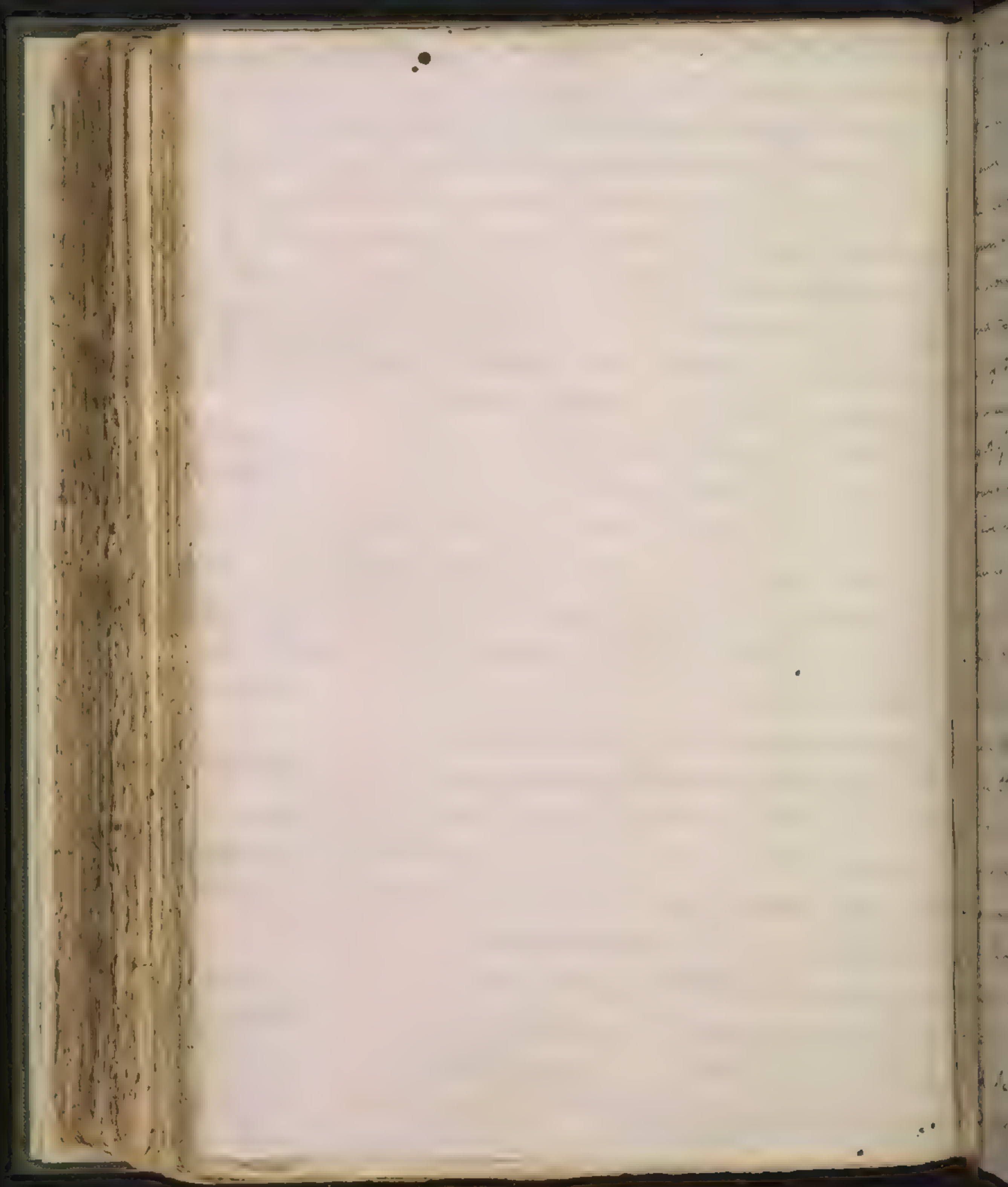


than before. Even the invention of Gunpowder is the strong de-
rive no advantage from his strength and the weak does not
suffer from his weakness. Men engaged in the Horrors of War
are more upon an equality. The matter used for this pur-
pose should be pure as well as the Sulphur, but it is of
no consequence whether the charcoal be obtained from
hard or soft wood or has been ascertained. The marks of good
Gunpowder are 1st To kindle immediately on coming
in contact with fire 2nd To leave very little or no remain-
ment. The second depends on the intimate union of the
ingredients and their exact mixture, the first on the pro-
portion of these ingredients. The best proportion is the
following viz 75 parts of Nitre $15\frac{1}{2}$ of Charcoal and
 $9\frac{1}{2}$ of Sulphur. The manner of making it is this the
 foregoing ingredients are put into a wooden mortar and
pounded with a wooden pestle for 12 hours being every
now and then moistened with water to prevent the vol-
atile parts from ascending and being dispersed in the
air. It is after perfect trituration taken out and exposed
to the Rays of the Sun and then becomes Gunpowder.
Stones are sometimes used for drying it but they are
dangerous. But as it is now extremely fine it has
many disadvantages such as attracting the moisture
of the air soiling the hands and blackening the Fire-
arms, it is necessary it should undergo another operation
called Growing. This is making it into three times the
Holes of which form the grains of a Gunpowder size. this is
after words



unwounded again to separate the dust from it. Glazed
powder is made by turning the glazed in a barrel
mounted on an axis for that purpose for 6 hours this
is done to prevent its soiling the hands and is chiefly
used for fowling, it is not so good as the other kind. The
explosion of this substance depends on the following
circumstances. The charcoal contains a great
quantity of fixed air which separates from it during
inflammation and the nitre disposes all bodies to
a rapid and sudden inflammation when in con-
tact with an ignited substance every particle of the
nitre then is in close contact with a particle of sulphur
which acts by the ~~it~~ it contains) and with a particle of
charcoal from whence the effects are speedy and more
remarkable. The fixed air of the charcoal is imme-
diately converted from its elastic to an elastic state
and the explosion is entirely owing to the exten-
sion of this air during inflammation.

It is observable that the workings of a gun barrel
are a small number to that of Hepor Sulphuris, this
is owing to the sulphur uniting with the basis of the
salt nitre forming a true Hepor Sulphuris. That
unpowder then is the best that has the most of this smel-
it shows that all the sulphur has been consumed
The powder is formed of Sulphur Nitre
and Salt of Tartar in the following proportions
viz. 3 parts of Sulphur 2 of Nitre and 1 of Salt of Tartar
It



It differs from gun powder as the noise is produced with-
out its being confined. The explosion arises upon the
parts being intimately mixed and all the particles be-
ing fired together and upon the fixed air contained
in the alkaline Basis of the Tartar. Nitre promotes
the fusion of Ores it only acts by its alkaline Basis,
when powdered and mixed with Zinc and iron &
exposed to a red heat it deflagrates with violence and
carries off their principle of inflammability. It dis-
solves readily in water but requires near 7 times its
weight of water. Its effects on vegetable substances are
no ways remarkable, but on animal substances
they are more remarkable, it preserves animal
substances and gives them a beautiful red color.
Origin of Nitre. It was long an opinion that nitre was
entirely a natural substance, but we now know that
it is seldom produced by nature. It was formerly said
to now looked upon as fabulous to be found in
beds in the earth in Persia India and China. The
ground may be perforated by the roots of plants and
hence some nitre may be formed tho not in large quantities
as some travellers report. It is almost always the
production of fermentation and putrefaction of
animal and vegetable substances, tho it is sometimes
found in a native state as on large Rocks here
called *Sol petrae*, under great Bridges in ^{the} rocks and
wine Cellars, among lime and some plants, sub-
lime &c.



lished. In Patna in the East Indies we are now that
it is not found natural or we have the process described
in which it is made in great quantities. The Manu-
factories of it are not now confined to the East Indies
or was formerly the case but it is made in various
parts of Europe. In Germany according to Brown-
ner the process is as follows, they first lime Rubbish
garden mould and ashes moistened with urine in
a small house with a window opening to the North
East. The reason that the window is open to the North
East is not to admit any vitriolic particles but because
the temperature of the air accompanying the wind
blowing from this point is more conducive to putre-
faction and thus to the formation of nitre. After the
Matter has remained for some time it is no longer ques-
tioned with nitre that 1 lb of it will yield 3 lb of nitre.
The nitre when thus produced is always mixed
with common salt. The King of Prussia and the
German Princes obliged their subjects to build their
fences of Rums straw and Earth and every 3 years
take them down to collect the Nitre that may have
formed this method is particularly followed by the
King of Prussia. If an oven is entirely unoccupied from
the workings of a small tower. Dr Franklin tells
us that an old man and his Wife make as much
nitre or vitriol by the whole business. In France
it is accidentally made by putting Rubbish or Pig-
on



no being in water with lime. When thus prepared
it is very improved. Common salt is frequently converted
with nitre this is operated by boiling away the water
till the salt forms in crystals and continuing this
till the crystallization ceases. This depends on a
singular property of common salt viz. that more of it
will not be held in solution by boiling than in
cold water after this the liquor is set to cool when
the crystals of the nitre shoot or a small quan-
tity of common salt is still dissolved with the nitre it
is removed a second time in this manner and it
is even necessary to separate it a third time before
the salt is sufficiently purified. What is contain-
ed in the liquor that will not crystallize is used
for Magnesia. There is another method of obtain-
ing Nitre mentioned by Glauber in this process com-
mon salt is absolutely converted into nitre. Com-
mon salt fertilizes the earth only by being conver-
ted into nitre and hence the ground is not fertile
the first or second years as the third because the hu-
mification has not taken place during that time
before the third year. The nitre does not float in
the air. Lime only serves to freshen the
earth or water, salt given for any substan-
ce is the only use of lime in manure where
there



There is no mould or vegetable matter Lime destroys the sand
effectually. The richer the land or the more vegetable
matter it has upon it the more will lime fertilize
it. Dung and Lime mixed together will rot where
nothing grows here the dung rots instead of vege-
table matter Nitre cannot be manufactured in
Great Britain, it is said this is owing to the moisture
of the air. Nitre is often found in a native state in
some plants tho in some more than others. Tobacco
contains it in great quantities hence it is obtain-
ed from the sweepings of tobacco Houses. In this oc-
casion tobacco leaves sparkle when thrown into the
fire. I have been informed that several Caverns in
the mountain parts of Virginia afford it in great quan-
tities. A Gentleman informed me that during the
late war he had made 4000 pounds of Salt petre
from one of these Caverns. It is probable they may
have formerly been the nesting places of Birds of passage
probably Pigeons the dung of which laid the foundation
for the production of this Salt. The earth in these Ca-
verns is what is commonly called lime stone Land
and very much favors the generation of nitre. The
method this Gentleman pursued was to dig the
earth pour water upon it and let it stand for some
time the liquor was afterwards decanted and to it
was added the ley of ashes made ^{by} boiling ~~not~~ which
much expedited the business. the liquors were mixed
warm.



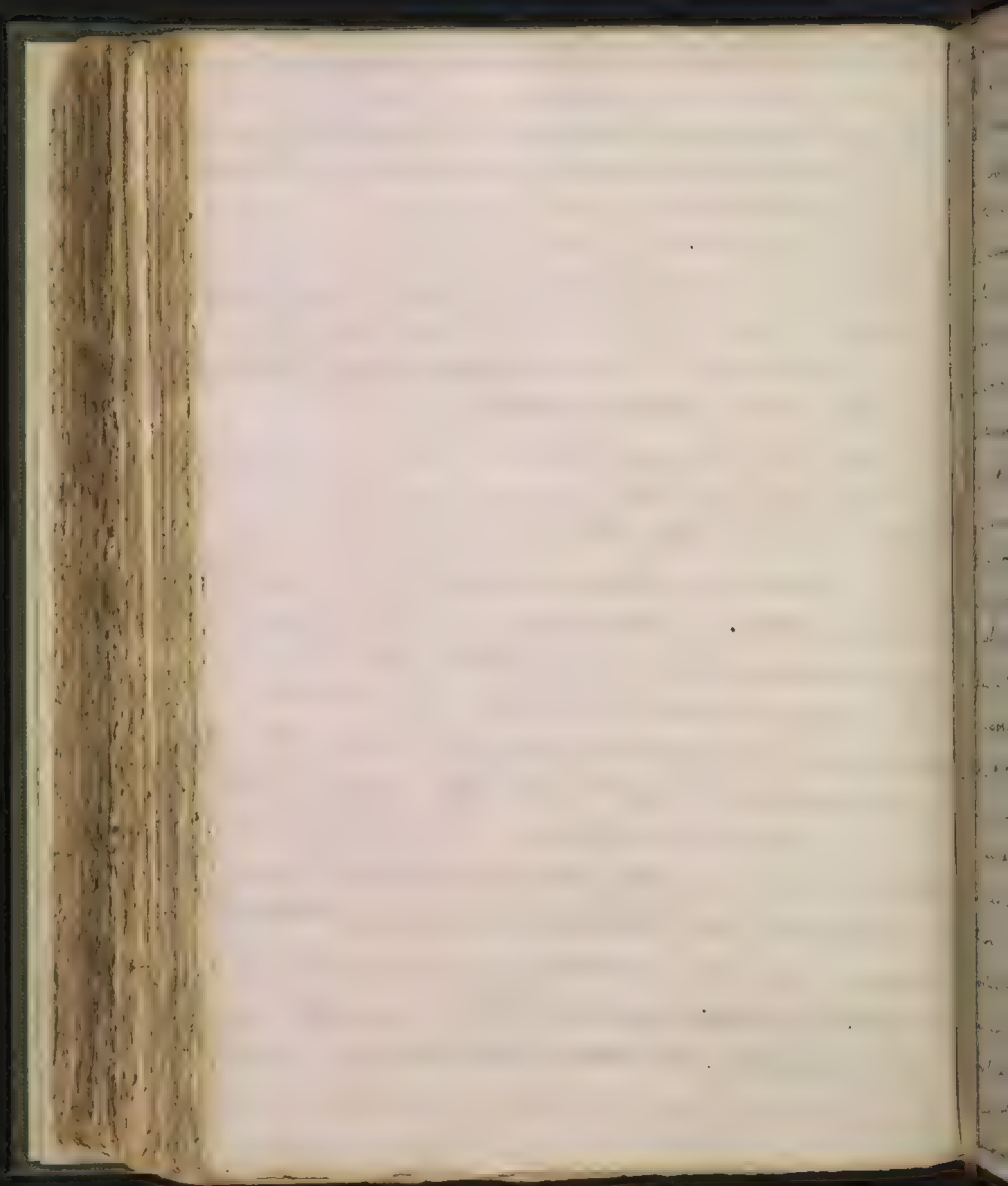
...and a turbidness was produced. This turbidness arose from the Ley throwing down some Earth or a superabundance of acid which was united with the nitre. This liquor was afterwards boiled and the Salt formed. According to Dr Stahl's opinion it is formed from the union of the formogenical acid with an alkali and some opusculent matter and that it is the product of putrefaction this seems most probable theory of its formation. There are 4 Methods of making Nitre the same as those used in making Cubic Nitre.

Nitrous Ammoniac is composed of the nitric acid and the Volatile alkali. It is seldom obtained in a dry, white form when exposed to the air it deliquesces. By heat it is converted into vapor. When thrown into the fire it suffers a kind of inflammation and detonation this depends on the ~~do~~ which always adheres to the volatile alkali. It is decomposed by the vitric acid or by either of the fixed alkalies. It has no remarkable action on the earths. It dissolves intimately in Spirit of wine. Its effects on other inflammables are not very remarkable. Its effects on metals are the same as those of the Vitriolic ammoniac. It dissolves readily in water and has no remarkable action on mineral or vegetable substances. It is altogether an artificial substance and there are 4 Methods of making it or of some of the before mentioned Salts.

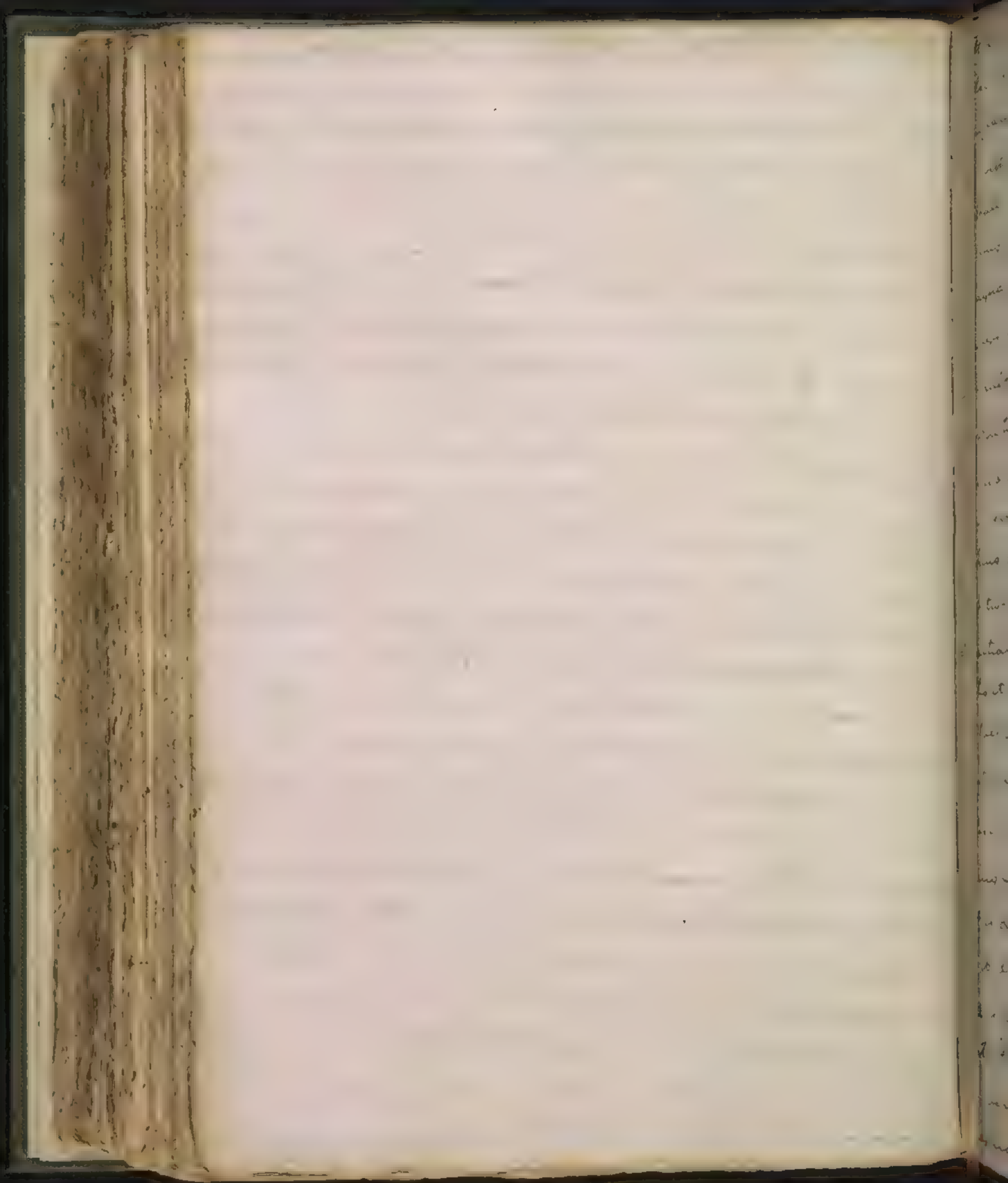
Common Salt



COMMON SALT is a composition of Marine acid &
fixed alkali. Its crystals are unequal unless obtained
slowly. When thrown into the fire it decrepitates but this
property is not peculiar to it for we find it in several other
neutral salts. It undergoes change from fire when pure
it may be decomposed by the vitriolic and nitrous acids
it acts upon some earths. When thrown into the fire it glazes
or vitrifies those vessels that are held immediately over it
in this manner the stone ware is glazed; from this prop-
erty it is used in glazing earthen ware. It acts upon
iron and has a strong attraction for other metals. It is
generally combined with magnesia and Calcareous
earth and frequently with the vitriolic acid and
Magnesia forming Epsom salts closely united with
common salts: from the first mentioned substance
it is separated by adding a fixed alkali with which the acid
will combine letting fall the Magnesia or calcareous
earth. In order to separate it from the Epsom salt we
must add a solution of chalk in the nitrous acid
when a double elective attraction will take place, the
vitriolic acid leaving the Magnesia to unite with the
the chalk forming salts which are precipitated, the
nitrous acid unites with the magnesia which is
separated by crystallization. There is another method
of separating the Epsom salt by adding to a solu-
tion of impure salt strong lime water, the vitriol.
acid



acid for water the Magnesia and unites with the dissolved
the Magnesia and the Salinite compound are precipi-
tated. This method is not so good as the former. If
lime water will cause a turbid appearance sometimes
when there is not a particle of vitriolic acid contained
in the ~~lime~~ salt. Common salt contains a quantity
of earth which disposes it to deliquesce in the open air
this earth is ~~added~~ separated by adding lime water to
a solution of common salt. It may easily be separated
by crystallization. We may understand the fact
why salt that has been melted in the fire becomes
deliquescent that it was not so before. It has been sup-
posed to be owing to the salt losing part of its acid but
a more probable cause is that the salt loses some of its
acid which is separated by the fire and then there is
a superabundance of alkali left. This always ab-
solves moisture. This is the common solution of the ques-
tion but I suppose it depends on a rather cause. The
common salt however pure contains a quantity of
vitriolic acid united to the Magnesia in it, when it de-
liquescence in this manner a view of double elective at-
traction takes place by this lime melted together.
The vitriolic acid being loosened from the Magnesia
the muriatic acid forms with the magnesia a salt
insoluble for deliquescence. The sal ammon. fixum
may be obtained in this manner. I do not object that
common salt loses none of its muriatic acid when
melted

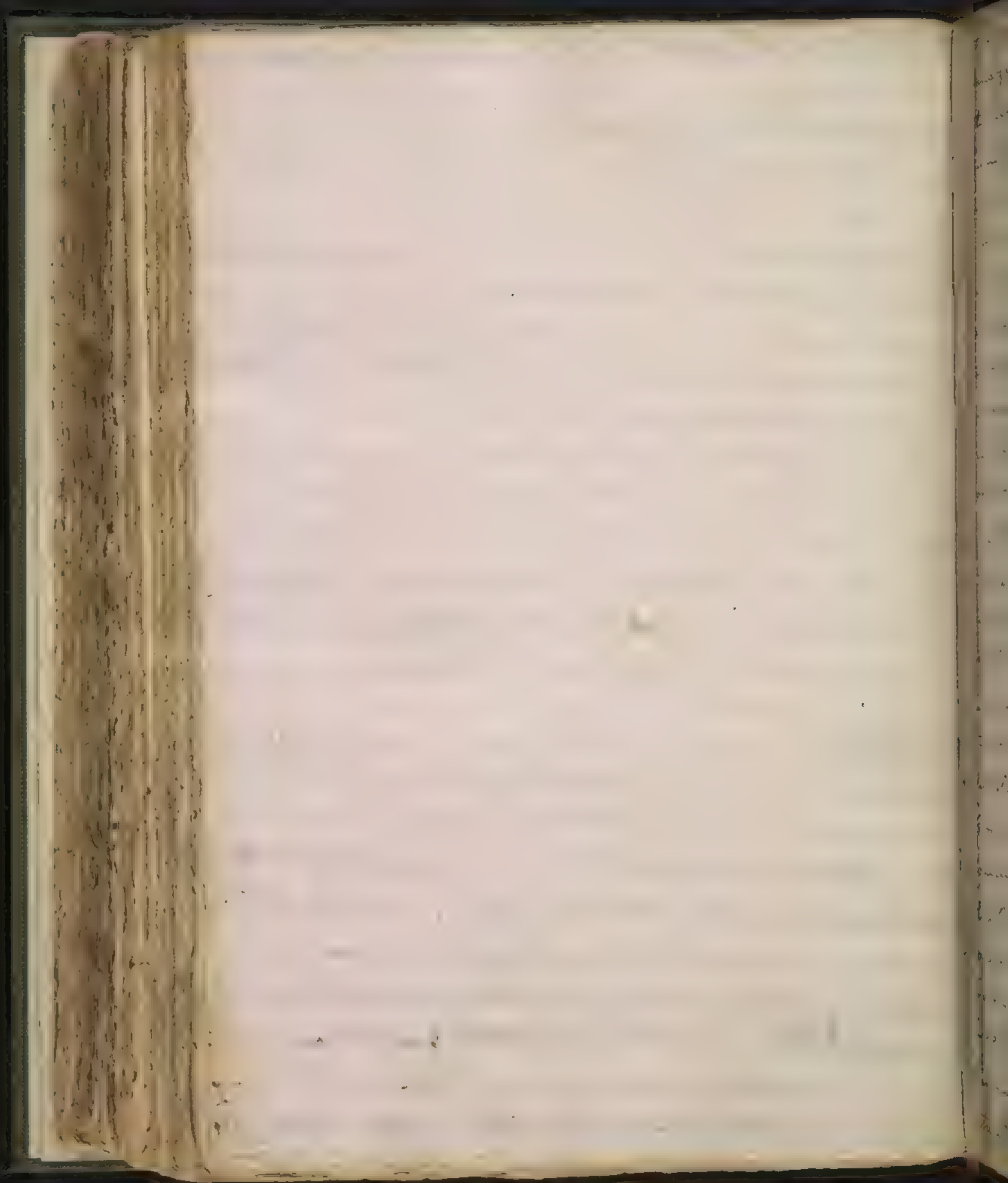


molten, but in this case I believe it is improved or taken mostly
boiled down. Common salt has but a slender attraction
for inflammables and cannot be decomposed by deflagra-
tion with charcoal. The manner of obtaining the fix-
ed alkali from common salt is first, to decompose it by
distilling it with the vitriolic or nitrous acids and then
deflagrating the salt thus obtained which will be either
glauber salt or Calce nitre with charcoal. Com-
mon salt is dissolved but partially in spirit of wine, if
this solution be set on fire (or a solution of salt in brandy)
there is a pale blue flame issues from it, a human
eye would thro this flame is a most disagreeable and
striking spectacle as it appears like that of a candle
dead two or three days or in the first stage of pu-
trification few persons can view this phenomenon
without emotion. It has no great action upon
metals in this unrefined state, but promotes a
solution of silver in the nitrous acid forming
Calce nitre and (by the muratic acid com-
bining with the silver) Luna Corned Common
salt is added to ours to promote this fusion
but it does this wholly by its alkaline basis, the
acid is assisted entirely by the intensity of the
heat. It consumes in 4 times its quantity of water with
this remarkable peculiarity that the water dis-
solves no more of it when heated than when cold.

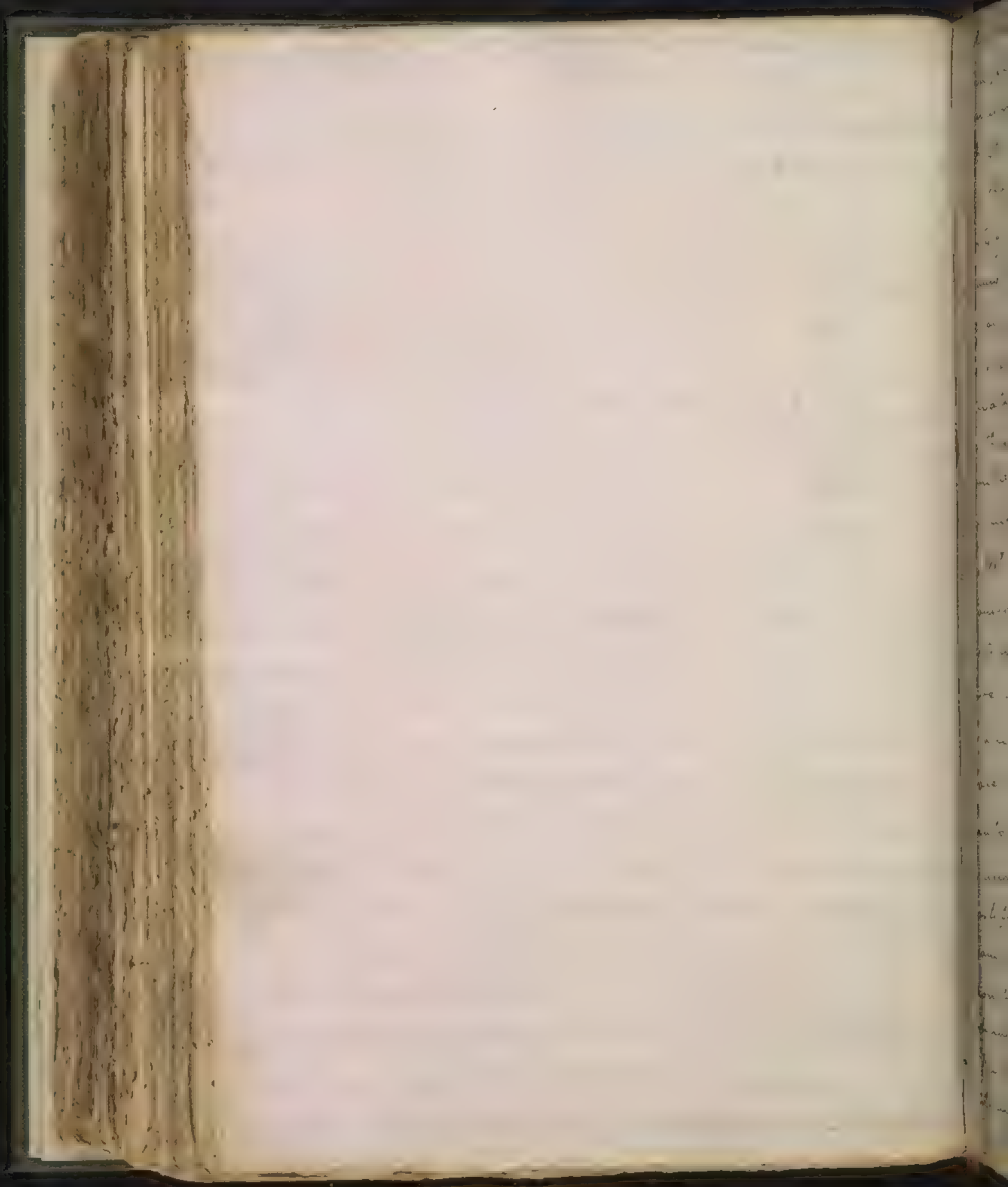


Its Action on Vegetables is not remarkable but upon animal substances moves so being in large quantities anti-septic but which is very particular in small quantities moving septic, perhaps this only takes place in solid bodies and is owing to this, it is known that a certain degree of moisture is necessary to the process of putrefaction and that if this moisture is confined in the substance it is carried on with more rapidity; a small quantity of Salt then by only hardening the surface confines the juices of the body it is applied to in the more interior parts which consequently promotes and increases putrefaction: But when a large quantity is applied the Body is equally acted upon thro its substance, it is hardened in its texture and its juices are separated thoroughly or well internally or externally: therefore in this case it must prove antiseptic.

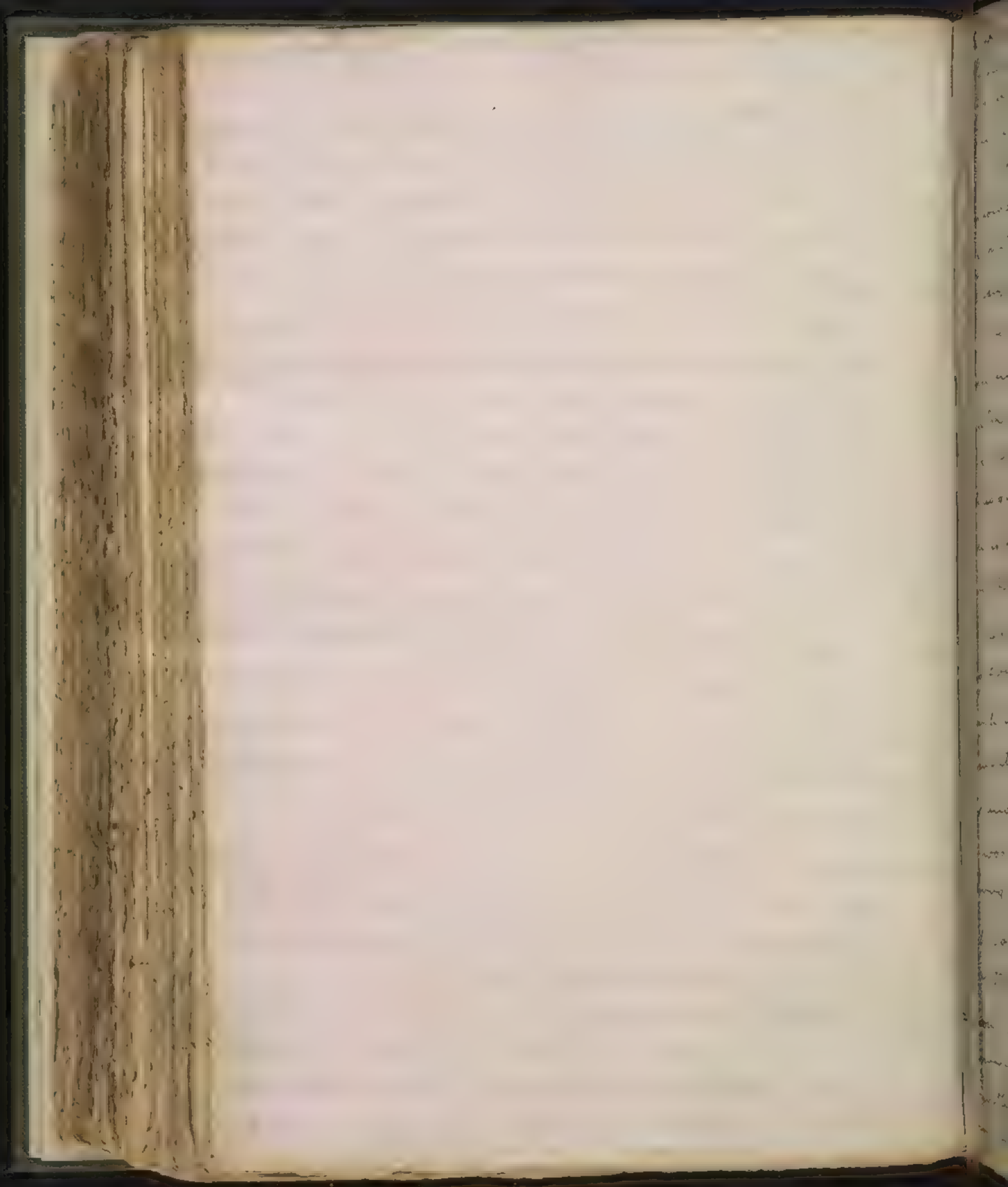
Nat. Hist. This Salt seems to be universally diffused thro the Creation and what the poet says of Jupiter may be applied with a little variation to this Substance "Amnia plena Salis". Every part of the Universe has a constant tendency towards dissolution and it seems as if its bountiful author had distributed salt every where to prevent this dissolution. It is found, 1st In the Bowels of the Earth and is procured in this manner in Poland Hungary and the East Indies, it is then called Rock Salt or



the gemmae. Near Bracon there is a stratum of this
amazingly large that it is computed to be sufficient
for the supply of the whole world for 1000 years. The
things in Hungary are astonishing and there are such amazing
quantities of it in the Danube and in the Rhenus
the same is found in the Rhine and in the Elbe
it is found in the Danube and in the Rhenus
in various parts of the Danube and in the Rhenus
in the western parts of the Danube there are many springs
abundant in the Redford County near Ford City
and in Kentucky. The fact is that it is
improved from these springs. It is found in great quantities
in the bottom of the sea. There have been many
specimens carried on whether the water of the sea was
originally salt or only rendered so by passing over
beds of salt. I must believe that it was originally
fresh as it is for wine, purposes and cannot be
put to its acquiring its saltiness from the quantity of
this substance existing at the bottom for if this was
the case it might be drawn up by siphons which in
showing generally gives the lead to know what
kind of bottom there is never observed a particle of
salt water so it must generally sand or mud.
It is observed that the sea is most impregnated
with salt near the Equator or between the tropics
this is owing to the heat of the climates and the
constant evaporation of the fresh parts of the water.



ter that takes place there. The quantities of Rain and Snow
which fall into the Southern Seas under the poles there
more dilute. Mr Boyer observes that 100 of Sea water in
the Baltic contained but 36 while the same quan-
tity of that under the Equator contains 37. The specific
gravity of Salt water to that of fresh is as 73 to 70. Notwith-
standing this small quantities difference in their spec-
ific gravity the density of the Sea water is much greater
and ships float and animals swim much easier in
Salt water than in fresh. The saltness of the Ocean pre-
serves this great body of water from putrefaction which
it would otherwise be liable to from the large quan-
tity of animal and vegetable substances that it con-
tains. Mr Bergman found that the water of the Ocean
contained more salt and was purer below than
near its surface. This must be owing to the putre-
factive substances and the exuvia of animals hav-
ing a natural tendency to ascend and float on the
surface. Washing the body with salt water has been
found to prevent sailors from contracting those hor-
rid diseases that prevail in warm climates and
an occasional bath of salt water might answer
the same purposes equally well. The dew that falls
in low places near the Ocean and so far from being
pestiferous that they are even found to prevent disor-
ders. The Inhabitants of the Island of Troms sleep at
night in their Huts and on the house tops with-
out



not experiencing any bad consequences.

We shall here make a digression which tho not immediately connected with our present subject rises from and by no means foreign from the science of Chemistry

Observations on Contagious Diseases

Gunpowder is found powerful in preventing the spreading of putrid diseases, consequently they are not prevalent in Saps where this substance is in greatest use. Whether it acts by the shock it gives the air or whether its ingredients enter into mixture with the putrid matter so as to destroy them I cannot tell most probably this may be partly owing to the quantity of acidogisticated Air that the Nitre contains and which is extricated by its explosion. During the War before the last a ship belonging to Admiral Howke's fleet had most of the men ill of a putrid fever and dying every day in this situation they met with a French man of War with which they had an engagement. The next day the men all began to recover and the progress of the disease was stopped. This was ascribed to the great quantity of powder discharged during the engagement.

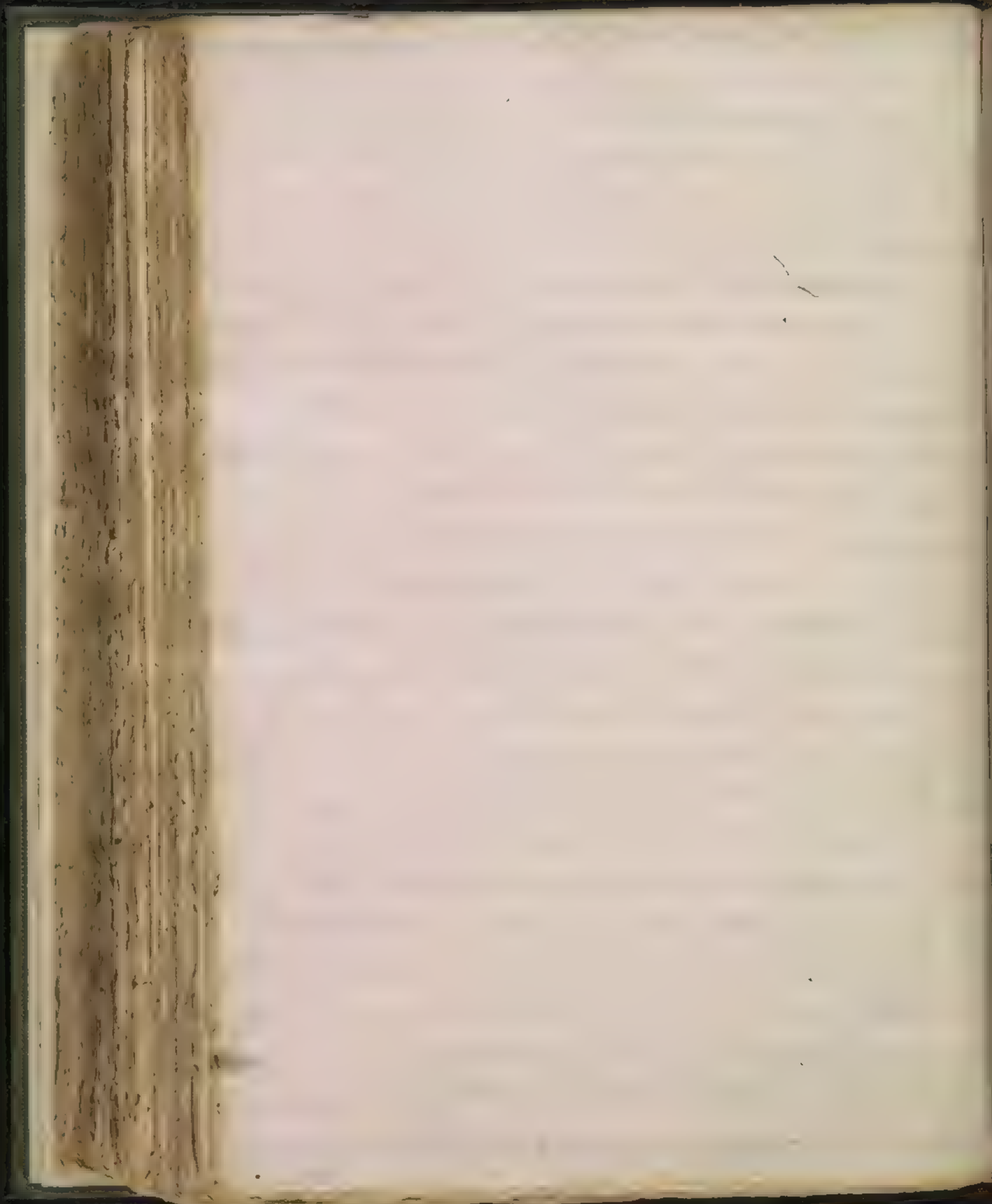
2^d Acids of all kinds are observed to purify the air hence the use of Vinegar in sick rooms and in contagious disorders. Another and very useful method of purifying this kind is by moistening common salt with a small quantity of water and afterwards decomposing it by the vitriolic acid the fumes of this

Mercurial

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Mucous acid acting and having very agreeable effects.
To avoid the morning and evening air and Dew
and never to go out of a morning on an empty stomach.
Many persons accustom themselves to take a dram
in the morning before venturing out but the eating a
crust of Bread or taking Bitters made with water or
they are powerful tonics would answer equally good
purposes. The practice of taking Bitters in the morn-
ing is very destructive they weaken the tone of
the stomach and lay the foundation for the intro-
duction of spirituous liquors or articles of diet the fa-
lacious effects of which I need not mention. Cham-
paine tea or an infusion of Gentian or other li-
beral herbs in water are much preferable to spirituous
or venous bitters none of the latter can be taken in this
way and filling the stomach with anything
gives tumor to the system. Some have supposed the
contagion to be introduced by the olive and hence
have tobacco but the work of the olive does more
harm than this practice does good. The vom-
itious matter produces no small harm when received
into the alimentary canal. This is sufficiently
proved by Dr Bowel of Truro. Dr. Head found that
none of the most powerful poisons injure the system
when taken into the mouth provided this is in a
sound state. The contagious matter is received into
the Nose and lungs and then the stomach
and



and Bowels are early affected in contagious disorders, this
is owing to the Connection which these organs have
with the Brain. A Gust of Wind a bit of biscuit by
strengthening the Stomach and thus giving reason to
the whole system enables it to withstand the effects of
contagion

4th To avoid Intemperance on the one hand and too great
abstemiousness on the other. Those persons in the west
indies who are most subject to be affected by diseases
incident to that Climate are generally Englishmen
who live luxuriously and intemperately on Beef and Por-
ter, and ~~the~~ Scots men who restrict themselves solely to
their Brothy Broth.

5th To keep some impression on the Nervous system to
prevent the miasmata from affecting it

6th To keep those parts of the Body that are most exposed
to the infection or Contagion covered with fatty or
oily substances. Hence Callow Chandelers and Cook
Boilers generally escape the Liqueur &c. and it is ob-
served that Hogs that are bit by the Rattle Snake are
not affected by the poison. The Natives in Great Britain

on this point use a mercurial ointment on the
glans penis to prevent their contracting the venere-
al disease from infected females but oil answers
equally well and it is a certain and infallible se-
curity against the venereal poison

Infectious disorders are such as are propagated by
the ^{contact} ~~contact~~ alone. Contagious are such as are communica-
=cated

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related from one person to another by the air being impreg-
nated with miasmata arising from the infected person
body originally. The plague is rather an infectious than
contagious disease or perhaps it is in the medium. I
certainly believe that it is never propagated beyond this
matter. Hogs are often bit by snakes this fact preventing
the bad effects of the poison I have heard that fowls
have been preserved from injury from immediately
rubbing the wounded part with oil or any fatty sub-
stance. Chemistry furnishes us with facts analogous
to this, the most caustic alkali blended with oil fur-
nishes an innocent soap; and acids have their acrid
parts destroyed by being ~~blended~~ united with oil.
I can easily conceive that there may be a cure for the
bite of a Rattle snake, but in many cases where per-
sons have recovered it or experienced no bad effects
from the bite perhaps the wound had been inflicted
upon some part where there was a considerable quan-
tity of fat. Leather will also in some cases prevent the
bite from penetrating deep. That the bite is fatal we
have no reason to doubt there are too well attested
facts which prove the truth of it. The persons bit gene-
rally expire in a day or two. A person related to
my family about 40 miles from this city was bitten
by a Rattle snake and expired in about 24 hours
he was seized with a puking which continued till
he died his skin became very yellow. The

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The Methods of separating ^{common} Salts from ~~the solution~~ substances with which ^{it is} ~~they are~~ combined are the following
1st By Congelation. by this method the fresh water only is frozen and the Salt precipitated in a solid form by the extreme cold; this is only used in the northern parts of Germany

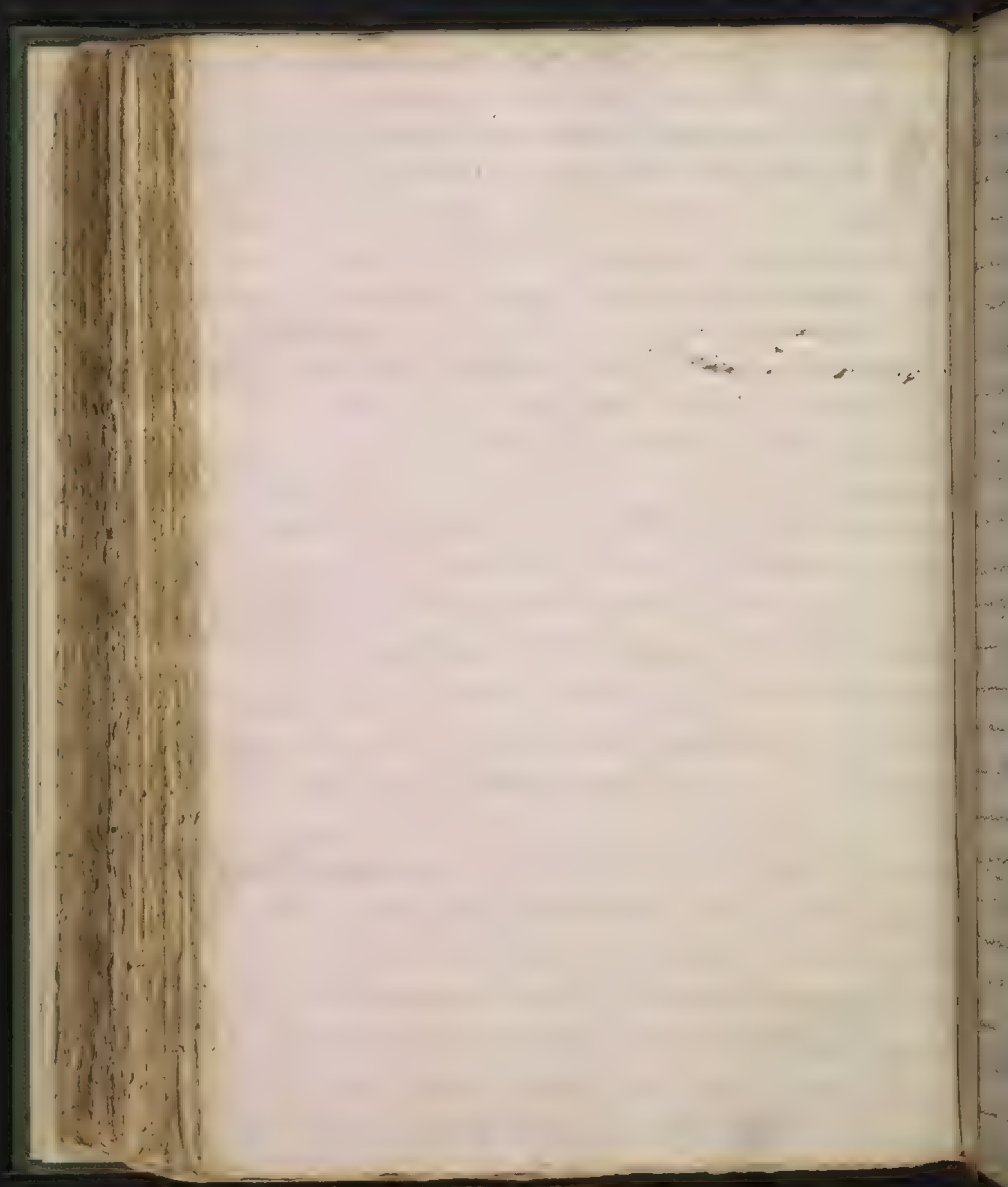
2nd By evaporating the fresh particles only of the water which either naturally or artificially flows in upon the land by the ordinary heat of the Sun. It is obtained in this manner in Holland France and Hungary but in greatest quantity in South America and the Cape de Verd Islands forming the principal trade of the Inhabitants in some parts they dig ponds admitting the water from the sea this Water is evaporated afterwards and the Salt is left at the Bottom It is obtained in this manner in Italy France and in some parts of Germany. In France in this manner the produce is much in two weeks or will last the Kingdom a whole year; this is bought up by the King his farmers general who afterwards sell it out at an exorbitant rate considering the small trouble and expense in making it. The Revenue upon this single article is said to afford a Million annually When thus procured it is called Bay Salt.

3rd Method is Evaporating the Water placed in ^{shes} ~~troughs~~ ^{themselves}

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refined by the means of fire this method is used in En-
gland and Scotland. They erect their salt houses near
the Sea, the water flows into a pit where it deposits
many of its impurities; this water is afterwards pumped
into a pan, and in this pan the fuel is placed and
round it there is a walk. Into the liquor when
cool is poured the whites of Eggs or what is more com-
mon oxes blood, this coagulates by the heat of the fire
and ascending carries with it all the impurities from
the salt. This is called Clarification or Clarifica-
tion the salt crystallizes. It is then poured into baskets
of conical figure where the water drains away
and leaves the Crystals of salt behind it is then col-
led mild salt. The same method is made use of
in purifying sea yemur: which is then called
Rock salt. In evaporation nothing but fresh
water runs this suggested to find the way of
obtaining fresh from salt water by a double distil-
lation. This is one of the greatest blessings to mankind
that ever was discovered and invents one of the
greatest calamities that they are subject to viz.
Thirst. There is one case where they are deprived
even of this resource that is food where fuel is
wanting but even here there is a method of re-
lieving their Thirst. It is a custom with the Eu-
ropean sailors when they are going to the East
Indies when they have used all their water to let
themselves



immerses down into the sea by which means this thirst
will be removed after they have stayed there some time
but discovery of a complete system of absorbents
fully accounts for this method of Relief. It would
be a very happy Circumstance if some thing could
be discovered which would precipitate the Salt from
the water by means of mixture. Glauber tells us
that the Glauber's ~~maria~~ a species of Salt to be
descended here after when heated red hot and thrown
into Salt water precipitated a considerable quantity
of it: This at least tends to show the possibility of
such a discovery.

4th The fourth method is evaporating the water by
means of a current of air. This is practiced only in
Germany. The water is pumped up several feet from
the ground and suffered to boil on a balance that
afford an extensive surface as a number of Twigs
placed conveniently, by this means the evaporation
is increased and the Salt falls to the ground in a
solid form from which we may have the final
remains of the water. All parts of the Earth are supplied
with water from the Ocean. Evaporation would
not go on sufficiently were the ocean always still
and calm, to obviate this the winds are raised
and the billows dashed against each other By this
means a greater surface is exposed and evaporation

is increased



now more rapidly carried on. It is pleasing to trace
the goodness of the imputed Creator in what at first
might appear the most deformed parts of
his work. We shall find, all discord harmony,
or partial will universal good.

There are 4 artificial ways of making this salt the
same as those of obtaining the other salts mentioned.

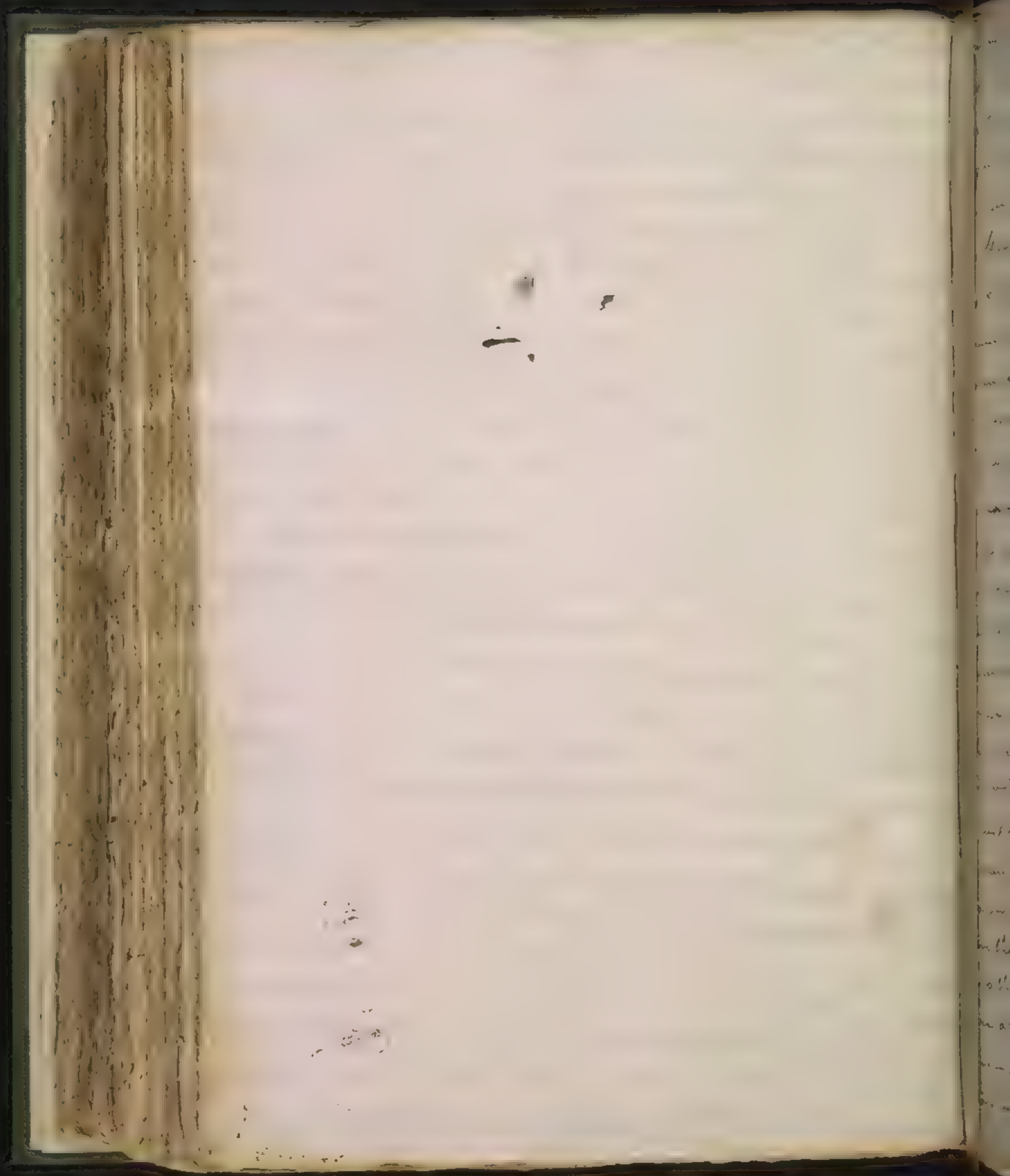
Sal. digestivus is composed of the mucous acid
and the fixed vegetable alkali. The Effects of Heat and
mixture are the same as on Common Salt. It differs
from this in the form of its Crystals and that it
dissolves in greater quantities in hot ~~and~~ than in
Cold Water. It is entirely an artificial substance and
the same 4 methods are used in obtaining it as of
the other salts.

Sal. Ammoniac: commun. or Common
sal ammoniac is composed of the mucous and the
volatile alkali. It is brought to us in cakes of a dirty
brown color concave on one side and convex on the
other answering the form of the vessels in which they
are manufactured. It evaporates in a degree of
heat below its point of fusion but cannot be de-
composed by the action of fire alone. The vitriolic
and nitrous acids and both of the fixed alkalies
decompose it by the means of heat but the heat
must not be pushed too far when the nitrous acid

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is used, lest the nitrous ammonia that is then formed
should take fire and explode and break the vessel. Care
is necessary when the nitrous acid is used to confine the
steam lest they do mischief to the vessels and the operator.
Some of the nitrous acid generally rises with the nu-
matic acid forming aqua regia. When the fixed alka-
li is added to decompose this salt the volatile alkali
is separated and rises into the receiver by mixture with
out heat. Calcareous earths act powerfully upon sol-
ammoniac and decompose it and this is the way
that the volatile alkali is obtained. I have before re-
marked that a ^{great} quantity is produced when the earths
or lime & chalk &c. are added in a mild state owing
to the fixed air they contain. It has but a slender ob-
jection for inflammables and requires 32 times
its weight of spirit of wine to dissolve it. It is de-
composed by many of the metals ~~say~~ by copper, Iron
Lead, Tin Mercury Regulus of antimony &c. If a
small quantity of the matter is used the most volatile
is separated and carries it over into the receiver. If Copper
is used no verberis is formed. If iron flowers more
is formed. Notwithstanding the sol ammon. is decom-
posed by these metals the volatile alkali will sepa-
rate them all from their solutions in the nitrous
acid in the cold. It dissolves in water producing
or generating 20 degrees of cold but more than
20° If dissolved in boiling water. It attracts wa-
ter from the air proving deliquescent. Its action is



ways remarkable on animal and vegetable substance. It renders the veins of vegetables and the gum which is united with the resin more soluble in water.

Origin. The knowledge of this substance appears to have been very very ancient. Pliny mentions it. It was obtained in Africa from the country near the temple of Jupiter Ammon from whence it derived its name. The ancients thought it was a natural substance from whence some have asserted that they were unacquainted with the true sea ammon. but it is probable they knew the substance tho they were ignorant of the manufactory of it which was perhaps reserved and in the hands of but a few. It is found out early to be an artificial substance tho a small quantity of it is sometimes found near Sicamo's and war pits. Sea ammon. may be likewise produced by exposing the urine and to the breath of animals. but it is procured for the most part exclusively from doo. The juice used for this purpose is brought where it is manufactured in quantities is the Urine of animals. The urine of the woad bleeds in the hills and is collected by the hot-thes are then broken on the Baker of salt which add them to their necks in the form before mentioned (see above and concave below) taken out (vid. Journey Vol. 1st p. 247 Aug.) There has been a manufactory lately established in Scotland near Edinburgh where



have they extract it from any kind of food. A manufacture of it has lately been established at New York City by Messrs Marshall & Co. The now common preparation by them is much superior to any I ever saw imported in appearance and very probably in quality. The mode of manufacture is the same as those of the *salts tartarum nitratum munitatis*.

We now come to those salts which are formed from combining the vegetable acids with the different alkalis the first is,

Regenerated Tartar. This is composed of the acid vinegar and the fixed vegetable alkali. It is decomposed by the action of fire alone and is very concentrated so much so that the acid is united with spirit of wine will form Ether. It is likewise decomposed by either of the three mineral acids. It does not act on Limestone. It dissolves intimately in spirit of wine and is soluble on metals and dissolves readily in water generating heat. When exposed to the air it deliquesces. Its deliquescence in the air depends on the fact that the vegetable alkali has to vinegar the alkali attracts the moisture of the air and not the neutral salt. It has no remarkable action on animal and vegetable substances: it is always an external substance.

The antiseptic Mixture of Riverius is a composition of the native acid with the fixed vegetable alkali. Riverius recommends it to stay nausea and to stop vomiting, it has since been improved by Dr Boyden.

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out by first taking the salt of tartar in the form of a
bolus and afterwards washing it down with Re-
mon or Lime juice an effervesence thus takes
place in the stomach and the acrid acid is ex-
creted which seems to act entirely as a sedative in
the bowels.

Spiritus Mindereri is a composition of the a-
cridous acid or vinegar and the volatile alkali.
This is never obtained in a solid form. It evaporates
with little heat the same as that which water
requires to evaporate and it may be brought to
the consistence of Syrup by application of heat. In
this thick state it is very penetrating and is used to
dissolve obstinate schirrous tumors and swellings of
all kinds. The salt is decomposed by either of the fixed
alkalis and mineral acids. Its relation to earthy
inflammable metals &c. is no way remarkable. It
is entirely an artificial substance.

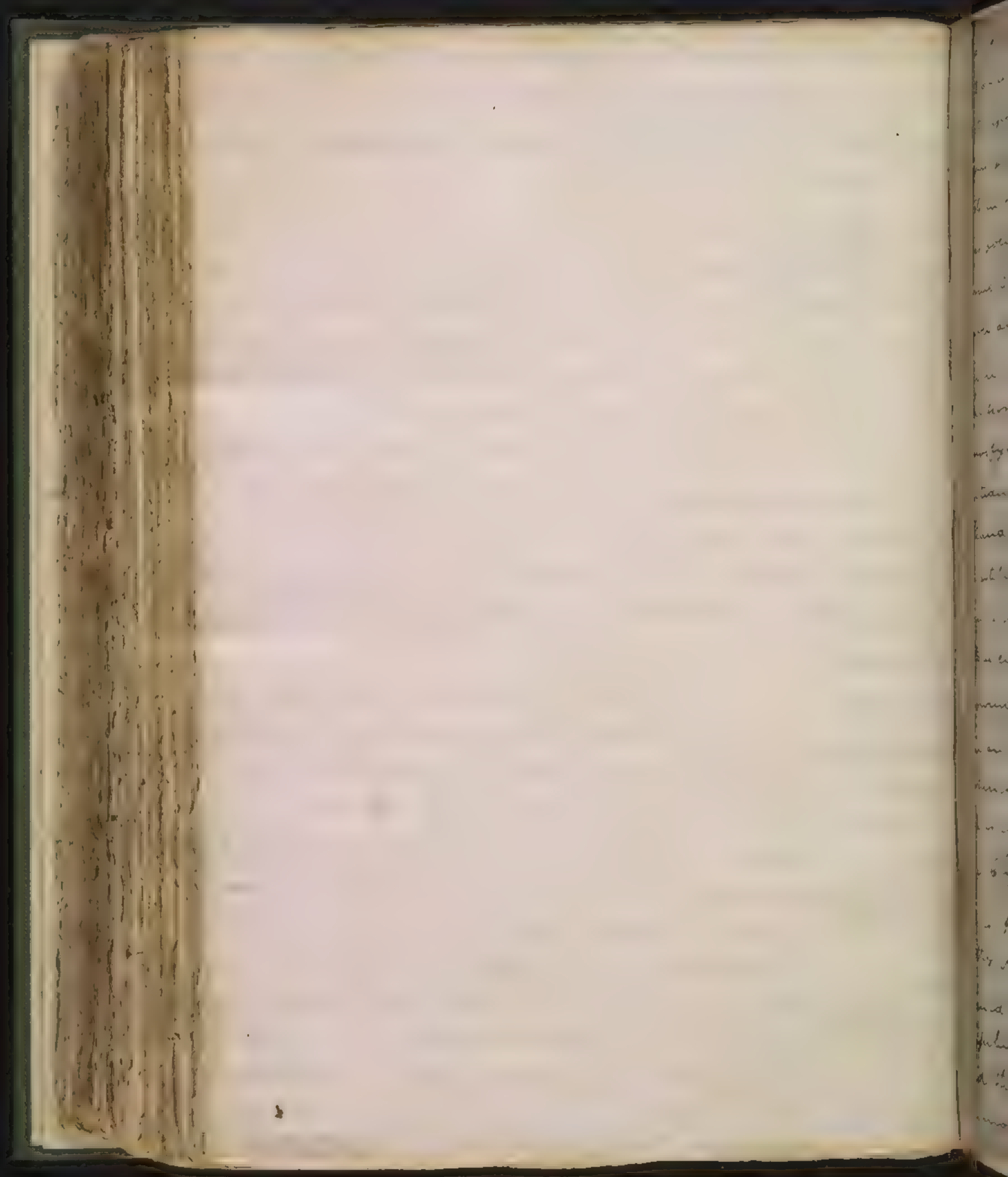
Sol Rupellensis is composed of the acid of tor-
ton and the fixed fossil alkali. It is decomposed by
intense heat but much easier by the mineral acids.
Its relation to earthy inflammable metals &c. has
not been attended to and is no way remarkable. It
dissolves easily in water. It has no action on vegeta-
ble and animal substances. This salt was first dis-
covered by Sergnette an apothecary at Rochelle &
after whom it is sometimes called Sol Sergnette de
Rochelle.



Rochelle. This I must long kept to a secret during which time it was thought an infallible remedy in Intermit-
tents but its supposed virtues vanished as soon as it was
made public.

Tartar Soluble It is a compound of the
acid of Tartar and fixed vegetable alkali. It is in-
soluble of fusion and by an intense heat it is converted
into coal. It is decomposed by the 3 Mineral acids
and even by the acid of vinegar. Hence it often fails
as a Solutive being decomposed by the acid in the
bowels. Its action upon earths inflammables &c
is by no means remarkable. It readily dissolves
what bears its name. It acts freely on animal and
vegetable substances. It is entirely an artificial sub-
stance. For the Methods of making it Boerhaave and
Morgagni are to be consulted.

BORAX is composed of the acid called Sedative Salt
and the fixed fossil alkali. Its Crystals are large ir-
regular and remarkably transparent. When exposed
to the action of fire it first emits ^{aqueous} vapor and
is then converted into a glassy substance which has
undergone no decomposition but readily softens in
water and again crystallizes. It is decomposed by the
three mineral acids and even by the vegetable acids
a sedative salt rising in the process by the application
of heat. It is decomposed by the muriatic acid in solu-
tion. It acts upon Earthy bodies vitrifying them: it
dissolves
Lime



disolves in spirit of wine when heat is applied and if this solution is set on fire it emits a beautiful green flame. It acts upon all the metals and assists in fusing them on this account it is used by silver smiths and other artists in soldering. It precipitates some metals from their solutions. It disolves differently in water requiring 30 times its weight. It acts but feebly on vegetable and animal substances.

Prigim. It is brought to us from the East Indies when first brought it is very dirty. The method of purifying was long a secret in the hands of the Dutch. It is now known and practiced in Holland. It was long unknown whether it was an artificial or natural substance. But the French Academicians have at length discovered it to be entirely artificial and that it is made by throwing fatty substances which generally contain an acid on fresh clay and suffering these substances to lay for 3 or 4 years at which time the acid is evolved warping and neutralizing the fresh clay. This is all we know how the Topical is formed is doubtful and we are ignorant whether it originally exists in the clay or is only formed by the addition of the acid. When B orox is disolved in clear water and afterwards crystallized the crystals are very small they are larger and more like the genuine B orox if disolved in
Lime

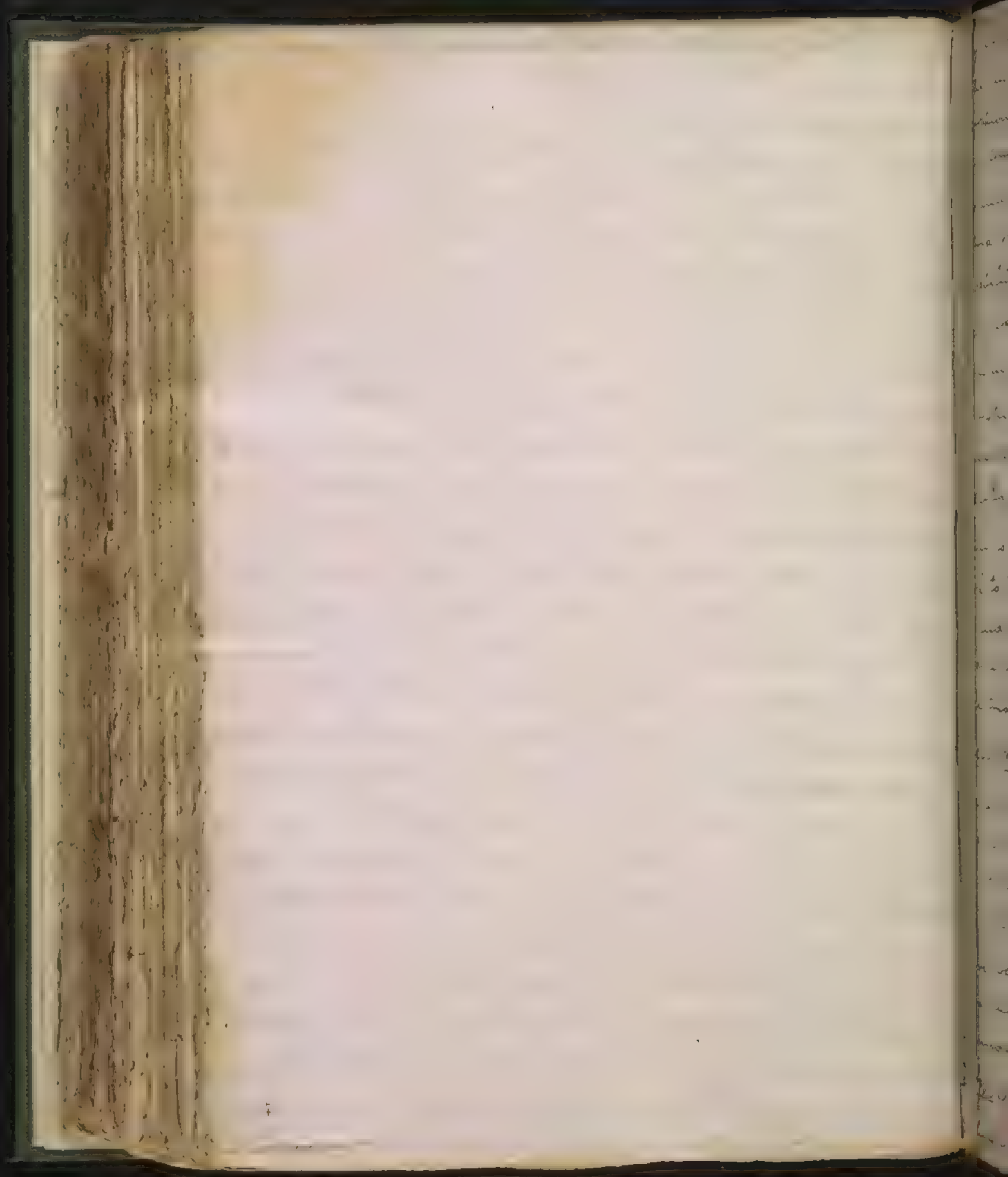
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Lime Water and after words they tallied: in and of 120
now changes the nature of vivants ^{riches the fusion of}
metals and is a salt.

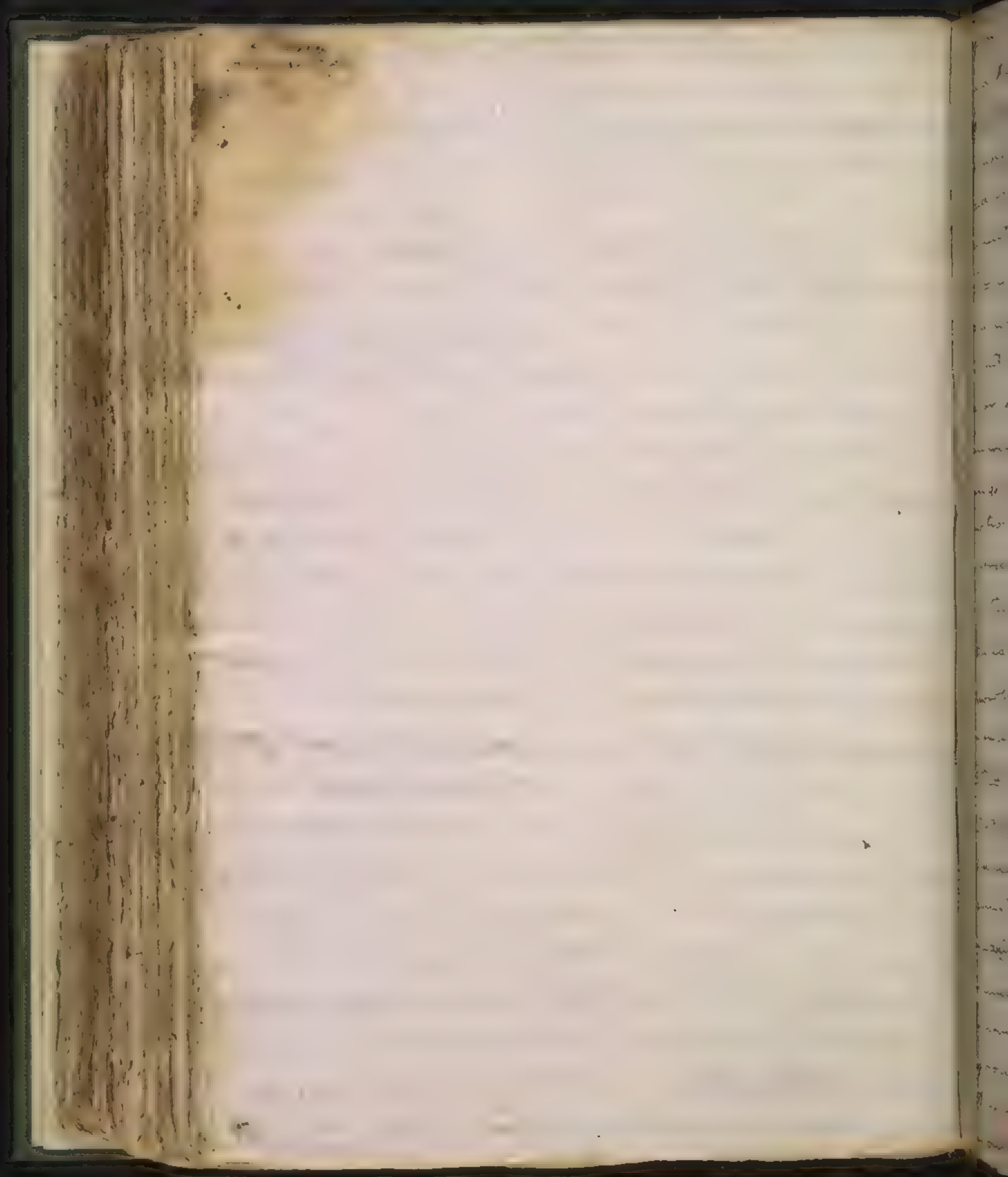
We now come to their use in Pharmacy and this is found
to be very extensive. They are all, however, as they have distinct uses
This mistake arose from ignorance of Chemistry and of the
animal economy. For the human body has been considered
rather as an elegant chemical vessel than as an anima-
ted machine or rather a system in which light we should
always consider it. They have all been applied to be cool-
ing. This property Doctor Brookes thought to be owing
to the cold generated in their solution, but this cannot
be the case as it is necessary to dissolve them before
they can be taken, besides all salts do not generate cold on
being dissolved, but some on the contrary produce heat
as Regenerated Tartar which is the most cooling in
its effects on the body. I believe that they all act entirely
on the system and not so much so indeed as simple acids but
their effects are propagated further in the system and
are not confined to the stomach; many of them reach the
intestines proving laxative, a small part of them may
probably enter the lacteals in a greatly diluted state and
being collected at the kidneys may prove gently diure-
tic and I am not afraid that they never prove drastic until
they reach the kidneys they sometimes have this effect
most as soon as they reach the stomach this certainly
must be owing to their acting on the stomach itself
They
properly



They are very useful in opening the Bowels and proving
gentle purgatives in obstinate costiveness they open the Bowels
without increasing spasm and without irritation in
the system hence they are very proper in Hemorrhages
and gonorrhoea. When costiveness depends upon
Hysteria or Hypochondriasis they are hurtful by increasing
the debility that then prevails and increase in obstinate cos-
tiveness when there is an atonia of the system. They are
useful in obstinate rheumatism and in this nota-
tive virtue seems confined to the external system. In
rheumatism whether they prove useful by gently open-
ing the bowels or by acting as a sedative on the external
system is doubtful. They are very properly added to the
Bark to take off the fixed spasm that may exist in remit-
tent and intermittent fevers.

Having thus taken notice of the general virtues we
shall treat of them particularly and first of
gum arabic Salts. This is one of the most useful of the
minerals. It is one of the sweet and best tasting purges
is found in small doses to be excellent in bilious fe-
vers. It has been of late much used in the dysentery
and is strongly recommended in this disorder by Dr
Boerhaave when combined with manna. It is likewise
an excellent substitute for that mineral and disagree-
able medicine Sassafras in the forementioned disorder.

Epsom Salts possess almost the same qualities as
gum arabic salts and are little inferior to them. It is not
properly



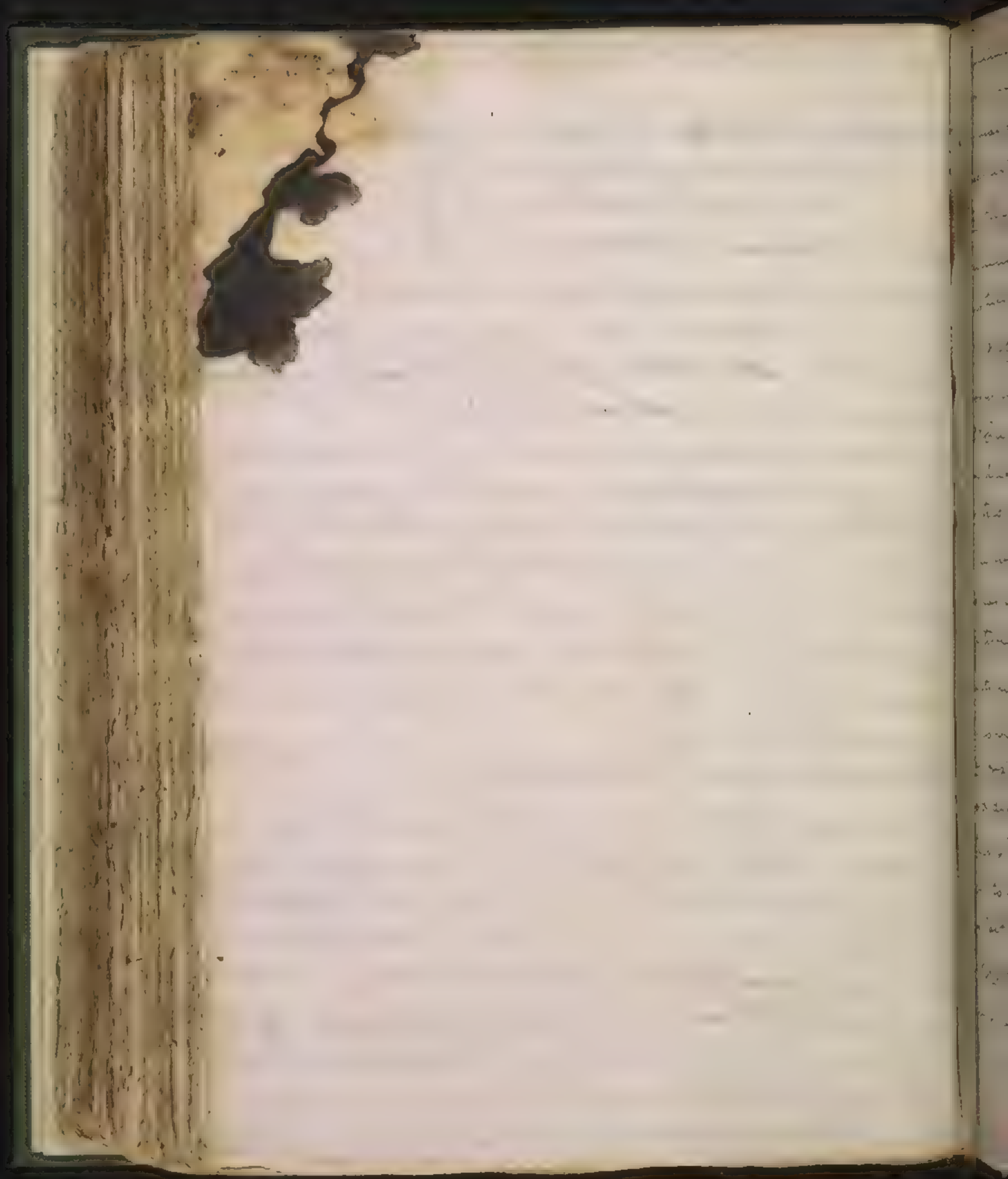
properly a neutral salt indeed but may properly be termed here.

Violated Tartar is a safe and gentle purgative and is chiefly to be used in rheumatism where it has been tried with success. It was the only purgative used by excellent character Dr. Magraw

Nitre is an excellent detarging and cooling medicine and is most useful in inflammatory fevers. Nitre detargent in aphthae of the mouth when mixed with may or or what is better Currant jelly. It is found to be improper in the asthma as it is apt to irritate the lungs, it should therefore be used here and in coughs with caution Dr. Bullen related the case of a person who could not take the least particle of nitre without producing a cough. This effect was even produced when it was thrown up in a glyster without his knowledge. In Haemoptoe when of the active kind it is an excellent remedy.

Nitrous Ammonia is but little used.

Common Salt has been little used till lately in medicine. In opening Glysters it is made use of and has sometimes checked the most violent vomitings but Sassafras in this case answers better. Dr. Bullen prescribes it in small doses for the Dropsy or swelling in the neck here it acts as an universal stimulant (viz a tea spoon full every morning). In Haemoptoe it is a most excellent medicine, when taken in a dry form in 3 cases out of 4 it has proved a cure. The manner of exhibition



inhibiting it is to take a tea spoonful at to the B. St.
morning gradually increasing the dose as the stomach
can bear it. Common salt has likewise been used to fix
supra in Hemorrhages of all kinds

Nitric Ammoniac is seldom used in
the common col ammoniac being found to
its virtues.

Common Ammoniac has been said to render the
prosyne of intermittent regular and has been used
by Dr Bullen in that intention however he says he
never knew it answer that & end.

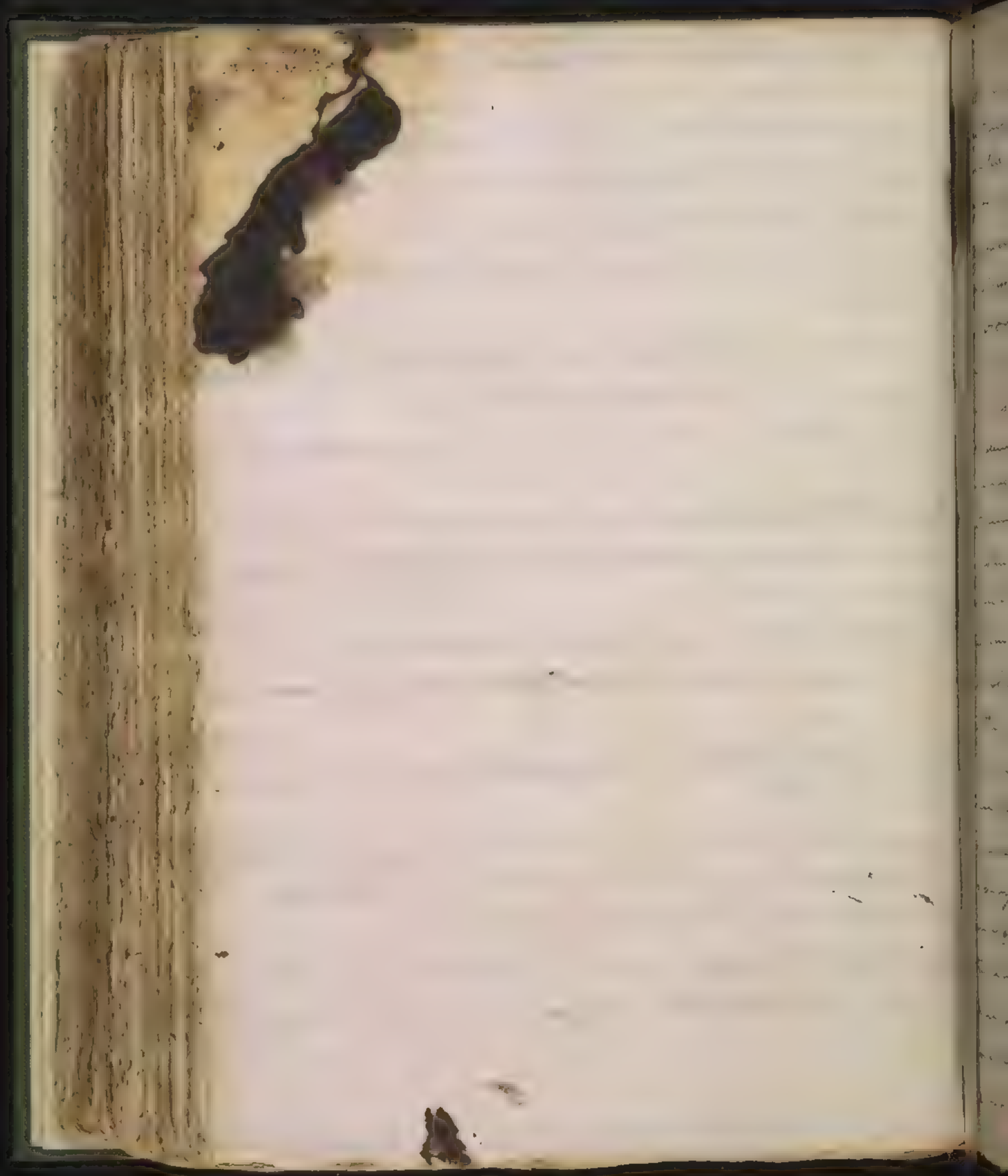
Mithrid Mindever is a very agreeable medicine
and in large doses proves diaphoretic but in small
doses has no effect.

Digestive Salt is not what we would imagine it
from its name for it does not promote digestion and
has no virtues in any disease

Regenerated Tartar is an agreeable salt and may prove
a good diuretic.

Tartar Solub. is sometimes used as a purgative but it
is liable to undergo a decomposition in the stomach
hence salt ought therefore to be preferred.

Sac Kerpellensis is entirely void and is
however an agreeable purge.



Earths

Earths may be defined those bodies that are not inflammable, nor volatile but extremely hard and converted into Glass by fusion or the Action of fire. They are divided into 5 kinds viz. 1st Absorbent or 2nd Gypsaceous 3rd Clays 4th Flint or Vitrescent 5th Hyaline or Apyrion Earths. We shall treat of them in order.

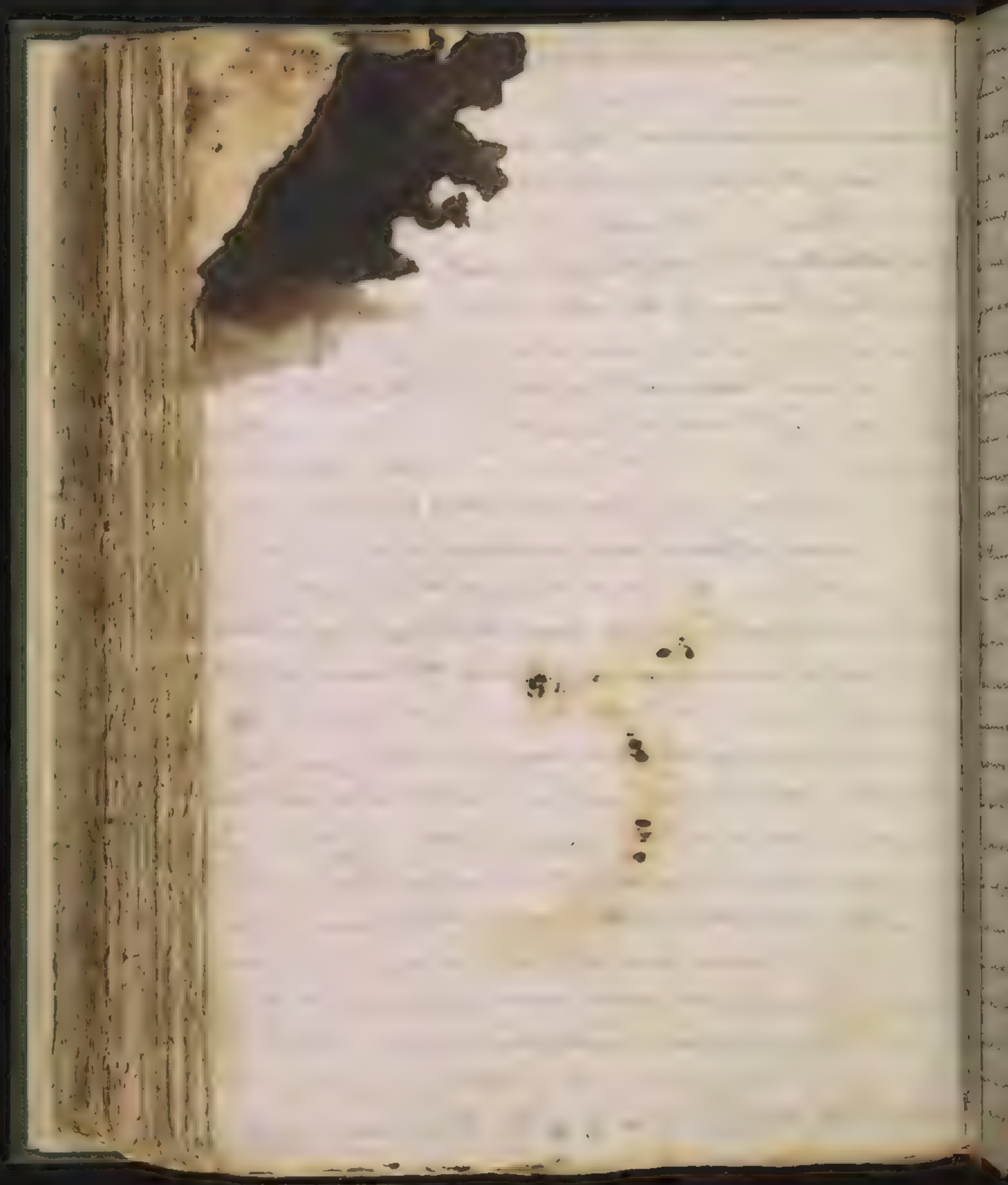
The Absorbent or Calcareous. The chief and distinguishing property of this kind of earth is effervescence with acids. This effervescence is to be particularly attended to: there are other earths which seem to contain Air and to give it out upon mixture with acids but this is distinguished from true effervescence by not being so sudden nor so impetuous or not carried on with much violence. To distinguish them from these earths we must wash them in water to eliminate this air and dry them and if they then effervesce with acids it is a mark of their being true Calcareous. This is likewise a method of trying Lime Stone the more it effervesces the better is the Lime Stone.

There are very various in their appearance and texture and differ in the following particulars, viz. Some are hard some soft, or marble, or hard and chalk soft. Some are transparent, or Crystals, some are opaque and differ not in their appearance from common earth or Lime Stone. Of these Earths Lime appears to be the most considerable and to possess in some degree the properties of all the others. We shall therefore begin with this.

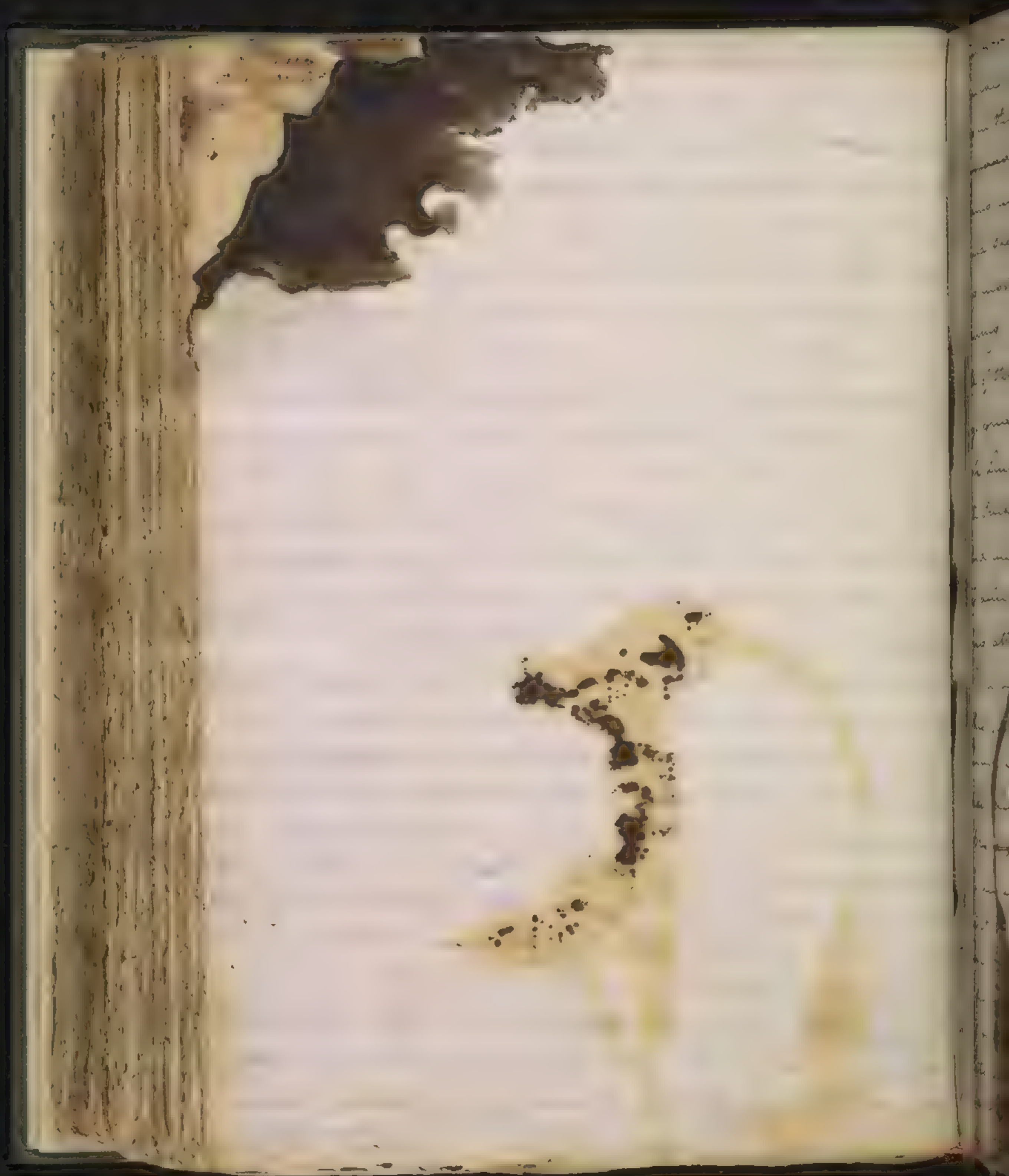
Lime exposed to the fire undergoes a considerable change and



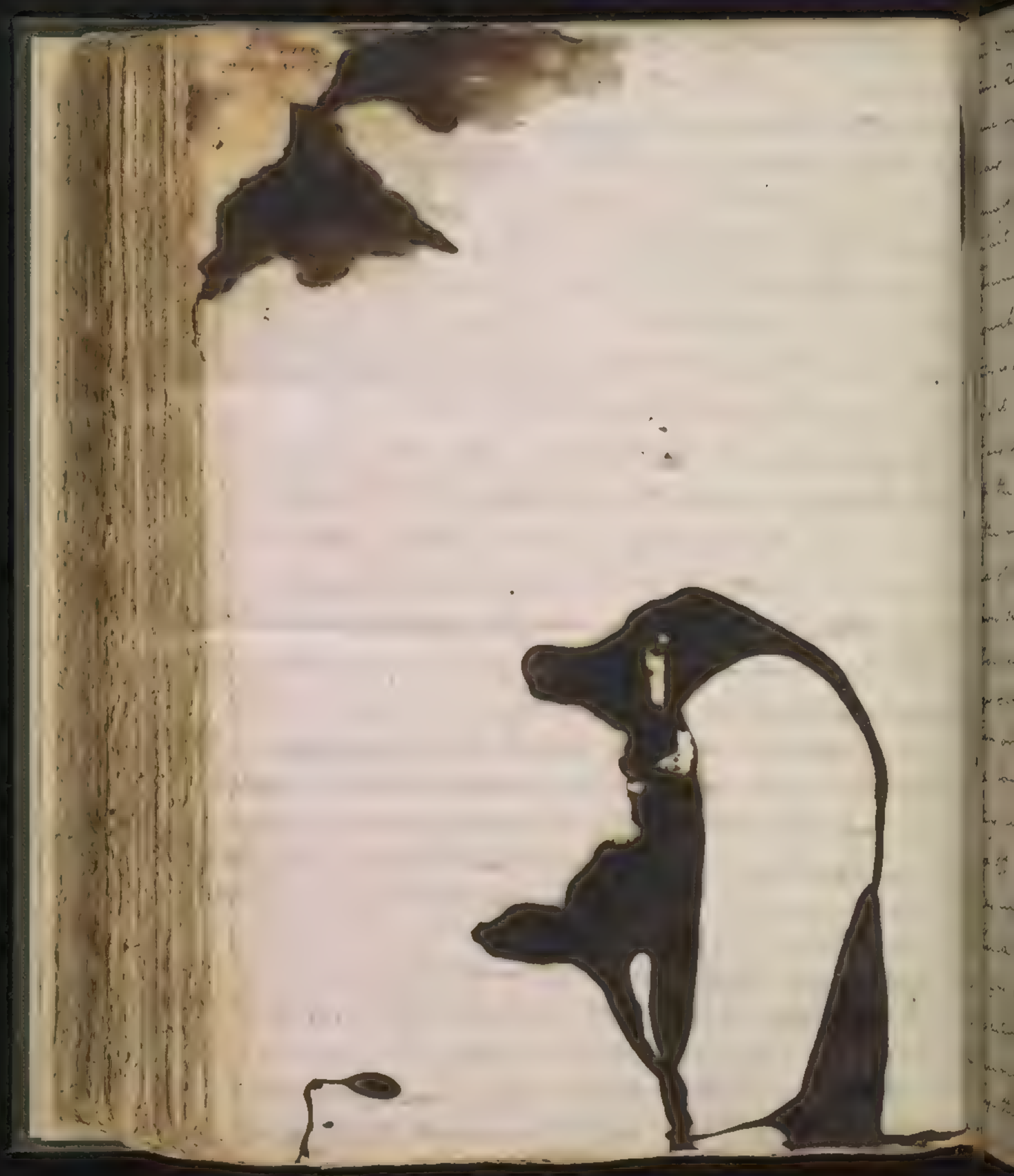
and loss one third and sometimes
becomes very acid it is then capable of
corroding many substances which before
was. Lavoisier thought, on account of Lavoisier
(just in Lavoisier's Chemistry) this loss was
to its attracting the particles of fire, but now
it is entirely owing to the extraction of fire
united with the vitriolic acid with violence and
easily forming Selenites. The effervescence that takes place
upon adding the vitriolic acid to lime depends on the
extraction of fire as the same or in the Alkalies. To
determine the quantity of air lost takes $\frac{2}{3}$ of Stone Lime
with as much vitriolic acid put them into one scale &
balanced them with sand then add them together and
the lime will be found to have lost $\frac{1}{4}$ of its weight. If
Salt of Tartar is used instead of Lime the same effect
will also be found to take place. With oil and
or it combines but weakly and may be separated from them
by the addition of the vitriolic acid in a compounded state. With
the vegetable acid it unites but feebly. Oxidative salt has no ac-
tion upon it and it has but little attraction to alkalies in
this mild state. If the alkali is caustic this becomes mild
and the lime becomes caustic. Its relation to neutral Salts
is very slender and it acts upon none of them except Sal
Ammoniac. When combined with this a volatile spirit arises
in the reaction. The lime unites with the muriatic acid
and the fixed air and $\frac{1}{2}$ or $\frac{3}{4}$ of the Sal ammoniac arises in
the



the form of volatile alkali it is to the Bot-
any lime. Lime is often found united to
with sand and water it is used here to prevent the mortar from
cracking upon being dried. The Volatile for
pose that the Antients had some particular
for excelling ours but when our mortar stands for
any length of time we find it lasts exceedingly well and
it is probable we have lost nothing but that the mortar we
use now is the same that was made use of formerly.
calcareous earths assist in calcifying clays and vitreous
earths and is added to the ores of some metals to pro-
mote their fusion. It has no attraction for inflammable
bodies in its natural state. It is insoluble in water and acts
scarcely on animal and vegetable substances.
If calcined or as it is called quickened it then receives
the name of quick lime and is rendered highly acrid
and corrosive to animal substances. In this state it unites
with all the acids not excepting sedative salt but with
out effervescence or it is deprived of its fixed air. The con-
ditions formed are the same as when lime in its mild
state is used, but its effects upon the alkalies are different.
When fixed or Volatile alkali in their mild states are added
to quick lime it becomes mild and the alkalies are rendered
caustic. The sudden change produced in the lime or its
restitution to its mild state depends upon its attracting
fixed air. Thus the Potential country is prepared from the
formation



purification of fixed air. If ~~the~~ to the Bot-
moniac the volatile alkali ~~is~~ becomes Stone
ins in the Receiver in a very acid state. This de into fix
is prepared produced with or without heat into
moins in the Bottom is fat ammoniac
liquid shell so called from Shells of ~~the~~
lung most frequently used and the product generally
appearing in a fluid state. This is the famous liquid
shell of the Baron Schomberg who gave it internally in
large quantities as a solvent for the Stone: with marble
quick lime forms Stucco Work. Quicklime unites
with Sulphur and oils the mixture with the latter is
turbid and a kind of Soap is formed. It has at the same
time action on Metals as Stone lime. Quicklime has a
strong attraction for water, must be added to defolved
it. When water is out it grows warm then
smokes, sparks and comes to a dry powder provided
too much water has not been added. it is then called
sacked lime. If more water is added than is suffi-
cient to slack it the lime is defolved. More
than an equal quantity of water must be added to def-
olve it the ounce of ~~lime~~ dissolves one grain
of lime, one pound of ~~lime~~ Thus lime wa-
ter is prepared which has several properties peculiar to
itself or alkaline ~~it~~ and turns the Symp of
violets green. Lime water loses its virtues if from ex-
posed to the air at which time a Film rises to the Top
which attracts fire becomes mild and falls to the Bot-
tom



town 2nd By boiling the lime is precipitated to the Bot-
tom. Quicklime when exposed to the air becomes Stone
lime by attracting the vital and converting it into fix-
ed air. To prevent this the Masons make quicklime into
a mass with water which prevents the air coming in
contact with any part but the external surface. After
it ^{has} become mild by thus being exposed to the air it may
be quenched a second time by the action of fire. Lime
water is of great use in the arts The soap boilers make
use of it in the manufacture of Soap. By saturating
the oil from the fixed alkali it facilitates its union
with the oil or fat. Quicklime is of the greatest service
in the refinement of Sugar. It acts by destroying the
acid of Sugar and thus prevents its crystallization. The
raw Sugar or imported to us from the West Indies
is boiled with one fourth part of lime water in
large Copper vessels with the whites of Eggs or Oxen blood
which are added to attract the heterogeneous particles
and clarify it. The dross is attracted by these substances
or they coagulate and rises to the Top. It is then skim-
med off. When no more dross rises which happens gene-
rally in about 10 or 12 hours the sugar is taken out
strained and boiled a second time till no more rises
and for 6 or 8 hours as before till it is so thick as to
show between the fingers, it is then taken out and poured
into moulds with a hole in the Bottom to suffer the
gum that will not harden to run out and the
remains



remains is left till hard which is in a day or two. About
eight days after pipe clay and water is placed over this
and renewed every two or three days and an uniform
heat of 96° is kept up to keep the Syrup fluid. The use
of the pipe clay is to let the water distill gently on the
sugar so as to carry out none but the fluid parts.
The syrup is boiled once more with a small quan-
tity of lime water and undergoes the same treatment
and is converted into loaf sugar as before and thus
nothing is lost. Double refined sugar is made by boil-
ing the loaf sugar a second time. No loaf sugar
is fit for use till it has stood for 2 or 3 Months. Sugar
Candy is made by pouring the rich Syrup on sticks pla-
ced across each other and leaving it to dry, till dry.

The fineness of sugar depends upon the following cir-
cumstances 1st The nature of the Coarse Sugar 2nd On
the quantity of the Clay and water employed 3rd On the
manner of or nature of the instrument employed in refin-
ing. Wood block is the best Clay fire and one acquainted
with 4th On the number of times it has been boiled.

Lime water in refining sugar acts upon the following
principle viz. The coarse sugar contains a quantity of
acid which prevents its crystallizing. Lime water unites
with this acid forming a neutral salt very soluble in
water: the water poured upon it dissolves and at the
same



same time carries the salt out of the sugar. This salt is
of dark color from this being carried out by the water
leaves the beautiful white color of the sugar and on
the crystallization the destruction of the acid the
crystallization depends. Quick lime acts power-
fully on animal and vegetable substances. It was
much used during the plague at Marseilles Anno
1720 to corrode the dead bodies which they said prevent
the spreading of the infection or they would not
bury them. It seems to act here by the extraction of
fixed air from the dead body which exists in every
body in a compound state. The extraction hastens
their dissolution. It acts upon the same principle
in preventing Necrophores from filling up by rendering
the feces soluble in water urine that accompanies
them and carries them into the ground. A Bushel
of Lime thrown in now and then will have an oxi-
dizing effect and prevent the necrophory from filling
up for several years. It is like lime made use of as a
manure, but it must here be observed that it does not
act as a manure immediately or by itself but by defol-
ving and extracting something from the vegetable
substances over which it is applied. Thus when laid on
a sword it extracts fixed air and an acid from from
the vegetable substances forming a salt

Prigim

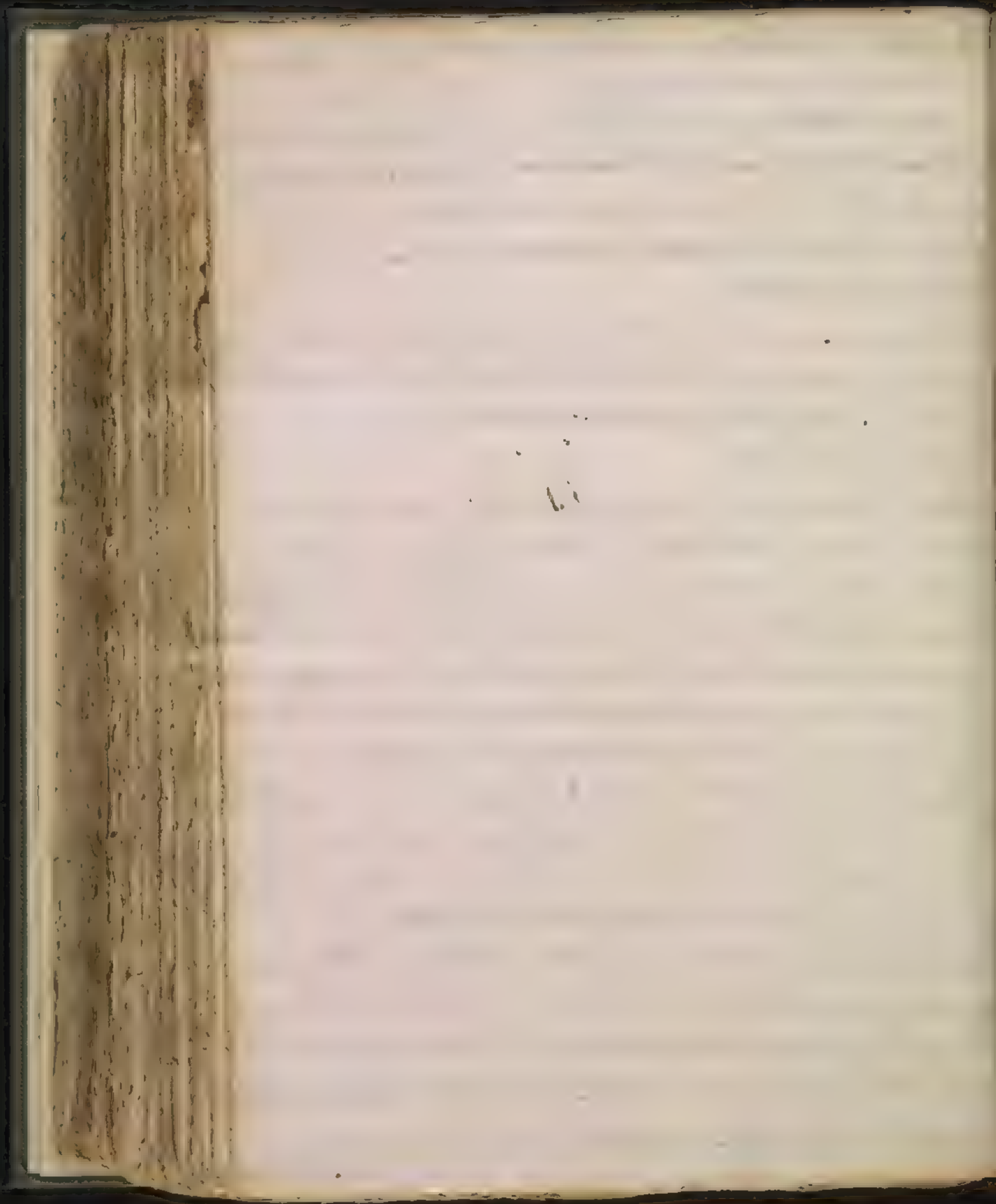


Origin. We shall first mention the different species of calcareous earths afterwards give the origin and natural history of each. 1 Lime 2 Chalk 3 Marble 4 Marble 5 Jaspers 6 Stalactites 7 Phytoliths 8 Looliths, to which may be added calined bones, human calculi and *Spiraea Magnesia alba* and the seeds of vegetables

Lime is more frequently found and in greater quantities than either of the others it is sometimes obtained on the surface but more frequently dug from the bowels of the earth.

Chalk is found in great quantities near the sea now mixed with flints. It was long a dispute whether the flint or the lime was the primary substance but flint is probable and formed from Chalk. The marks of shells sometimes found in Chalk depend upon their being washed upon it from the sea. The different colors of Chalk depends upon the metallic and inflammable substance that are combined with it. Many of the mountains in England are certainly composed of Chalk. The white cliffs of Albion so often mentioned by the poets altogether consists of it.

Marble is nothing but a composition of lime with a quantity of clay and a little sand. If we add the vitriolic acid to it, it is decomposed and Selenites and Alum are formed - a proof that it contains lime and the earth of alumina & clay. It is found in strata 50 or 60 feet below the



the surface of the earth and is valued as a manure
by the Farmers in England. They have iron ma-
chines for discovering the marble and sand is much
more valued where this is found. Marble owes all
its advantages as a manure to the lime it con-
tains and is preferable to lime on a sandy soil on
account of the clay that is mixed with it. When a
well has its proper proportions of sand and clay lime
will answer full as well when there is too much
sand we may first throw upon it a quantity of
clay and then add the lime, so that lime will be
more in every row instead of marble and it is much
cheaper. We have beds of marble in this country
but it is probable it will be of much use as long
as we have lime in such abundance and it would
not now answer the expense of digging.

Marble is found deeper in the earth in surface
of the earth. It readily dissolves in the vitriolic acid
forming a true solution it does not dissolve till
powdered and if an infusion of galls be added it
strikes a black color a proof that marble contains
a small quantity of iron. Marble has been sup-
posed to be formed entirely from shells but all
marble is not formed in this manner ^{that} which

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which is may be readily known by rubbing oil upon it when it will appear more evident Marble may be divided into the 1st that of one color 2nd Mixed or of all colors 3rd The Figured marble. If the Marble of one color the white is most generally used this is chiefly obtained from the Island of Paros and of which the famous Statues were made. The mixed marble is of all colors Red and white black and white &c it abounds in this Country. The mixed colors of marble and often artificial they may be made by pouring on the marble a solution of some of the metals in acids. The Figured marble is full of fantastical figures which may appear to resemble animals and vegetables &c.

Spars are those calcareous earths that appear in a crystalline form. They are divided into six varieties 1st the granulated 2nd the leafy 3rd the Rhomboidal 4th the cubic 5th the Island or Iceland Crystal 6th the crystallized Spar.

Stalactite is found in the hollows of mountains Mines &c and is formed by water dissolving and carrying along with it a calcareous matter capable of concretizing It appears like ice or in crystals These crystals are sometimes very beautiful and may sometimes deceive persons they are distinguished from the Gypsous spars or crystals by their effervescence with acids and from the true crystals of the flinty kind by their being cut with a knife.

Phytolithes includes all those calcareous earths composed of vegetable matters, wood petrified for instance. I would not



not have you suppose that all petrifications are composed of calcareous matters. The calcareous petrifications are distinguished from all others by their effervescence with acids. Petrifications are thus made; throw a piece of wood into a spring impregnated with a Mineral impregnation calcareous earth, after remaining there a certain length of time a perfect stone will be formed. not as some suppose from the actual conversion of the wood into stone but from the gradual imbibition of the calcareous matter into the pores of the wood. This accounts for their remaining the wood thrown into the spring in shape for by degrees the wood itself rots and is destroyed.

Toolith is include all those calcareous earths composed of animals and earthy matters as corals shells and other excreta of animals. So universal is the presence of calcareous matters that they are found even in animal bodies. The Bones Horns & Hoofs of animals are all of a calcareous nature when burnt this is evident.

Besides these there are certain calcareous substances found in animal bodies which are of a calcareous nature the chief of these is the Human Calculus.

The Urine is supposed to contain the foundation of Calculus from the changes which it is found to undergo in Glap. vessels. The sediment which in these circumstances it deposits appears to be of an earthy nature, but it will not do to apply this in the body or the urine never deposits this sediment till it cools and it cannot be cooled while in the body.



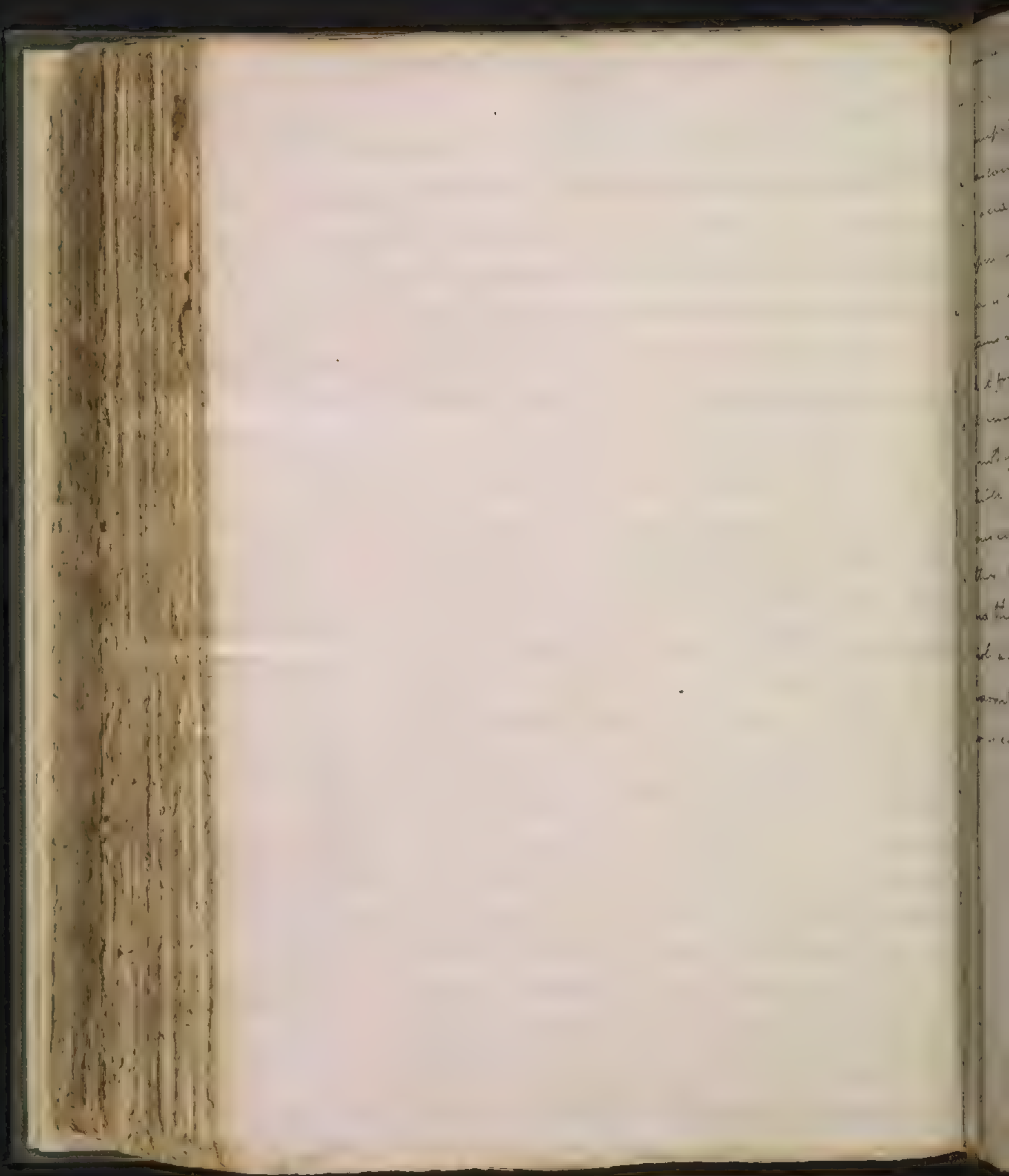
a third substance is necessary to form the concretion in the body, whether it be a particle of Blood, of coagulable Lymph or a musket Ball, shot or any thing introduced externally by the Urethra. In the Center of some Calculi a Drop of blood is found and in some a portion of coagulable Lymph. Any one of these substances attracts the earthy or calcareous particles the urine. So strong is the tendency which the urine has to deposit this sediment upon any extraneous ~~red~~ substance that Mr John Hunter in his treatise on the venereal disease particularly cautions against entering bougies into the Bladder and gives several instances where the bougies from remaining there for a short time were ~~now~~ perfectly incrustated with calcareous matter. The cause of Calculi I should imagine 9 out of 10 exists in the Kidneys from riding or a blow the Kidneys over hurt and the secretion is injured a drop of blood or coagulable Lymph is effused instead of the serous fluid this gets into the Bladder and frequently cannot from its size be discharged from its gravity it falls to the most depending part of the bladder and remains there acting as a nucleus of the future Stone. A Drop of blood is often discharged after an injury has been done to the Kidneys sometimes coagulable Lymph. This should be considered as a happy circumstance. A gentleman of my acquaintance at Edinburgh a T^r Biggs discharged a considerable quantity of coagulable Lymph with his urine which by keeping
became



named calcareous. We often read of musket Balls and make
that being the Nuclei of Stones. These have been introduced by
a wound which healed kindly and they remained behind.

The Tophus is generally found in the joints of a gouty people
and has commonly been considered as the proximate Cause,
but I trust I shall hereafter demonstrate satisfactorily that it
is not the cause but the effect of the gout. It is evidently of a
calcareous nature, it effervesces with acids it has many
of the properties of Chalk. As the Coagulable Lymph con-
tains more calcareous matter than any other part of the blood
it appears that Tophus is formed of this. It does not occur in
the limbs of gouty people only it is found in the Lungs from
whence it is frequently spit up it also forms round the
Teeth or the Saliva contains a portion of it.

Magnesia Alba is the next calcareous earth, it is a white
insipid substance. It is an artificial preparation formerly
it was procured from mother of nitre which is composed of
the nitrous acid and a calcareous earth. This was decom-
posed by a fixed alkali. The Method was first found out by
Woffman. It was afterwards made sometimes from the
Bittern after making common Salt. This Bittern is com-
posed of the Magnesia and Common Salt. It is decom-
posed as in the other case by a fixed alkali. In this coun-
try it is made from Epsom salt (and this is the cheapest
way of making it) is called from the Epsom spring from
which it was formerly procured. The Epsom Salt is now
made by combining the Nitric acid with Magnesia.



To make Magnesia we add a filtered Solution of Sol Tartar
to a white Solution of Epsom salt both filtered the Magnesia
is precipitated, dried &c. The Magnesia differs from other
calcareous earths as when it is combined with the vitri-
olic acid it forms a bitter, purging salt, but the others an
insipid substance. Mr Black observes that calcined Mag-
nesia is better than common. Magnesia not only
contains a quantity of fixed air hence when given to obstruct
acid it frequently gripes. This is prevented by burning
or calcining it which deprives it of fixed air and then it
does not effervesce with acids tho it decomposes in them.
Vegetable acids have been found lately to contain a cal-
careous earth. The ashes of vegetables contain common
matter. Mr Monnet of the Royal academy of sciences first
proved this by calcining them and afterwards adding vit-
riolic acid, he found a sediment with a small quantity
of Epsom salt and alum which shows along with cal-
careous earth they contain Magnesia and common clay.

Gypseous Earths

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Gypseous Earths are those substances which ^{are} easily scraped with a knife and do not effervesce with acids. The first effect of heat.

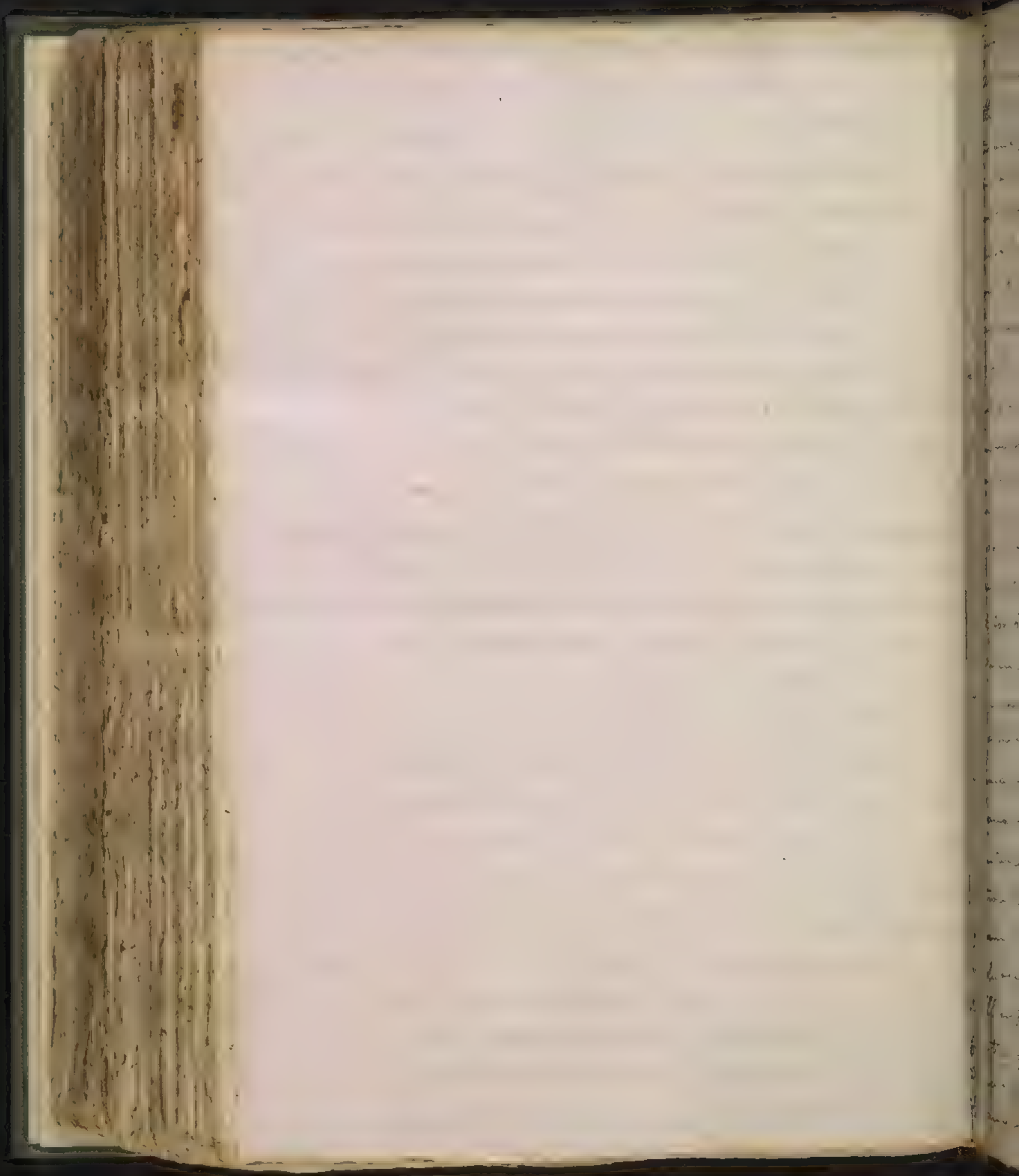
when the gypseous earth is to render them fluid and thus they are plaster of Paris. If powdered and thrown into water they are reduced to a stone. Heat separates the water from them. If heated and exposed to heat they appear to boil which effervescence is produced by the water arising from their bottom and escaping. After they are burnt if mixed with water they form a stony mass. Some degree of heat is produced upon this becoming solid this is owing to this again becoming ^{solid}.

Gypsum is composed of the vitriolic acid and a calcareous earth closely combined. It does not effervesce with the vitriolic acid because already saturated. When exposed to an intense heat the vitriolic acid and water is decomposed and nothing but a calcareous earth remains behind. None of the acids or acids is set upon it and we know little of its relation to the objects of Chemistry. No change is produced by either inflammation or metals. When heated it may be run into moulds.

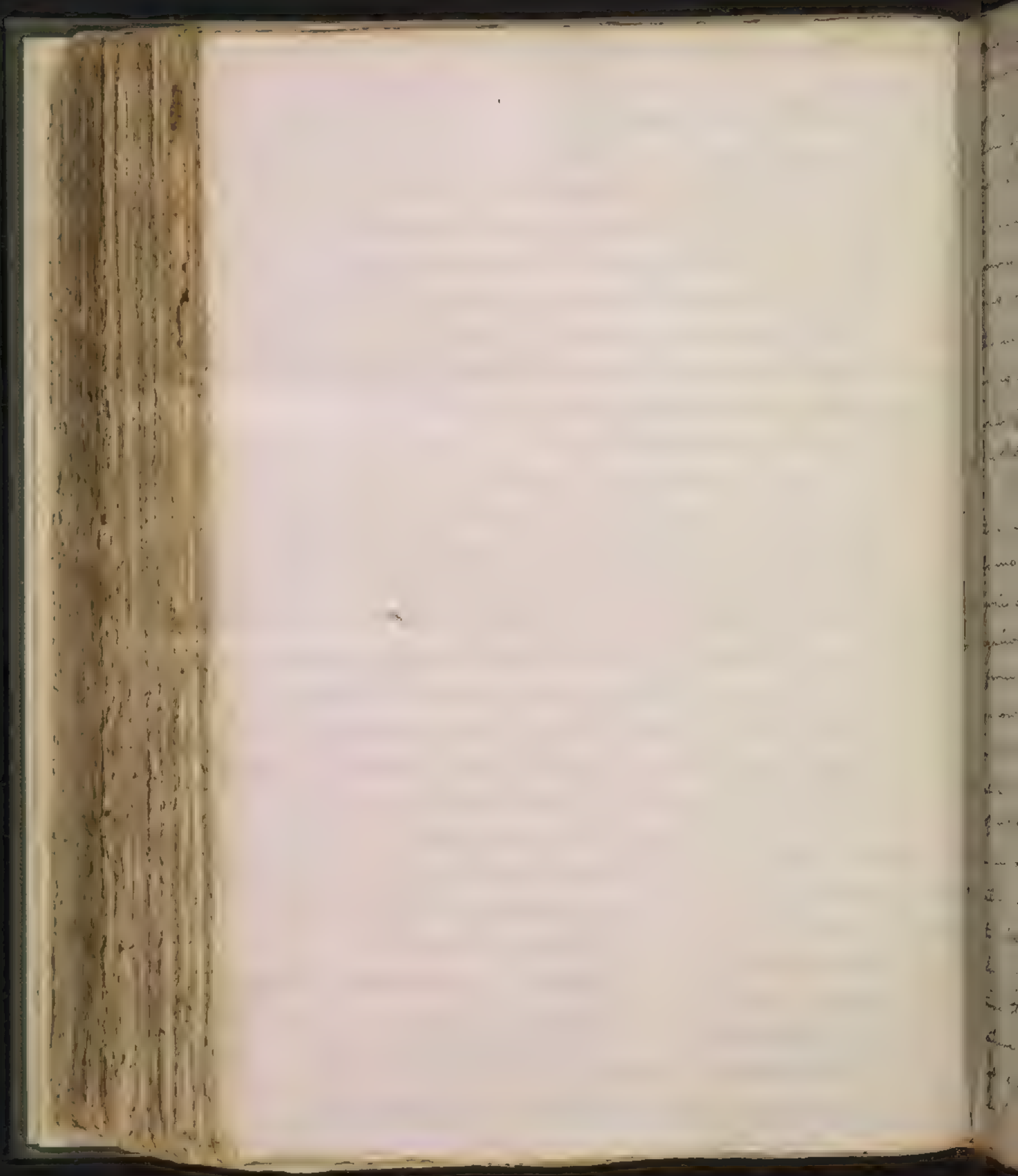
Has been burnt it may be mixed with water and run into moulds it will afterwards convert into a solid form from the water flying off and thus images of any kind may be formed. This practice is very ancient. The Tradesmen who work in it are liable to many diseases. Instances are upon record of the powder being received into the lungs forming concretions there and Hamazini on the diseases of Physicians begin 1st It is found in little grains resembling Brown Telt or grained Sugar it is then called Alabaster 2nd It is found in fibres running obliquely and parallel to one another. This species by J. Hill is called the Filvaria. 3rd In small transverse plates which are very flexible and the they crack do a

Answer
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do not readily ~~dissolve~~ break this is called Glauber's Salts or
Muriatic Acid. 4th In oblong columnar crystals this is the true
sulphur 5th It is found in the veins of mountains it is then col-
lected by naturalists the improperly Gypsum species. It is sometimes
of a dark color white and sometimes of a beautiful purple
color. Of late it has been applied to the purposes of Agriculture
It is found to be an excellent Manure and much preferable
in this respect to Lime a smaller quantity of it is sufficient
and hence it is expensive and it is known to improve the in-
crease of crops more than Lime. Four Bushels of it are
sufficient for an acre. It is to be sprinkled on the
ground early in the spring in March for instance. In
order for it to act as a manure it is necessary for it to
have a matrix for it to act upon. This matrix must
either be what the farmers call a sword or iron this
is not present during. The application of this to agricul-
ture is a modern discovery and is entirely owing to our
advent. The effects of it as a manure are really astonish-
ing. Whether it acts as a manure in fields where wheat
or corn are sown I know not but from facts I have
heard I am inclined to think it does not unless the
lands have been first improved by grass and then
grass ploughed in and then the wheat or corn sown
otherwise the gypsum earth has no matrix to act upon.
It is found running in veins thro mountains it is found
in very large quantities near Hollifox whence it was for-
merly imported to this City. Its good effects in fertilizing
the ground are much more remarkable than Lime.



as I was informed by a gentleman who tried
clays are found in greater abundance than any other species of
earth. The ^{clay} and of a soft nature can be made into a paste with
water and may be hardened in the fire. They are distinguished
from calcareous earths by not effervescing with acids. I prefer
of pure clay and shall confine myself to the pipe clay as it is
the purest. The more this is burnt the harder it grows and the
more it contracts or ^{shrinks} ~~contracts~~ as ^{clay} ~~clays~~ discharging the
inflammable matters. It is sometimes rendered so hard by bur-
ning as to strike fire with steel. This property of hardening by
the action of fire makes it extremely proper for culinary vessels
is more proper for this purpose when a little sand is added
as vitriol and unites readily with clay and forms alum
which is not easily decomposed by fire. The vitriolic acid ad-
vances so closely to the clay that the force of fire is not sufficient
to separate it. Mr. Geoffroy exposed 100 lb of alum to an intense
heat for 6 days and as many nights and obtained only
three ounces of vitriolic acid the water used it must con-
tain near ten times as much. It may be decomposed by any
of the alkaline salts and a pure clay is precipitated. If alum
is mixed with nitre or common salt the vitriolic leaves the
clay and unites with the basis of the nitre or common salt.
The nitrous and mucous acids having but a slight at-
traction to the clay run into the receiver and it is thus we
get them, moist. The calcareous earths decompose alum the
vitriolic acid unites with the calcareous earth forming calce-
stris. All inflammables repel the acid from the clay. I
know the great attraction which this acid has for the Δ
a species of phosphorus is made by burning $\frac{3}{4}$ of alum with
 $\frac{1}{4}$ of any vegetable matter the phosphoric property of which
depends



depends upon the union of the vitriolic acid with the principle
of inflammability of the vegetable substance and Iron de-
composes it perhaps by their principle of inflammability.

Alum dissolves in water it is used to purify liquors; the
vitriolic acid not being all saturated with the clay the super-
abundant part rises upon every heterogeneous substance
and carries it down to the bottom. It is used in this manner for

purifying wine. This purification is made chemically. There is
another method of purifying liquors which has the same effects
the acting in a different manner viz. by clay and sand with
the whites of Eggs which being intimately dissolved in the li-
quor collect the impurities and carry them to the bottom mechan-
ically. Rock alum is more impure than common alum having

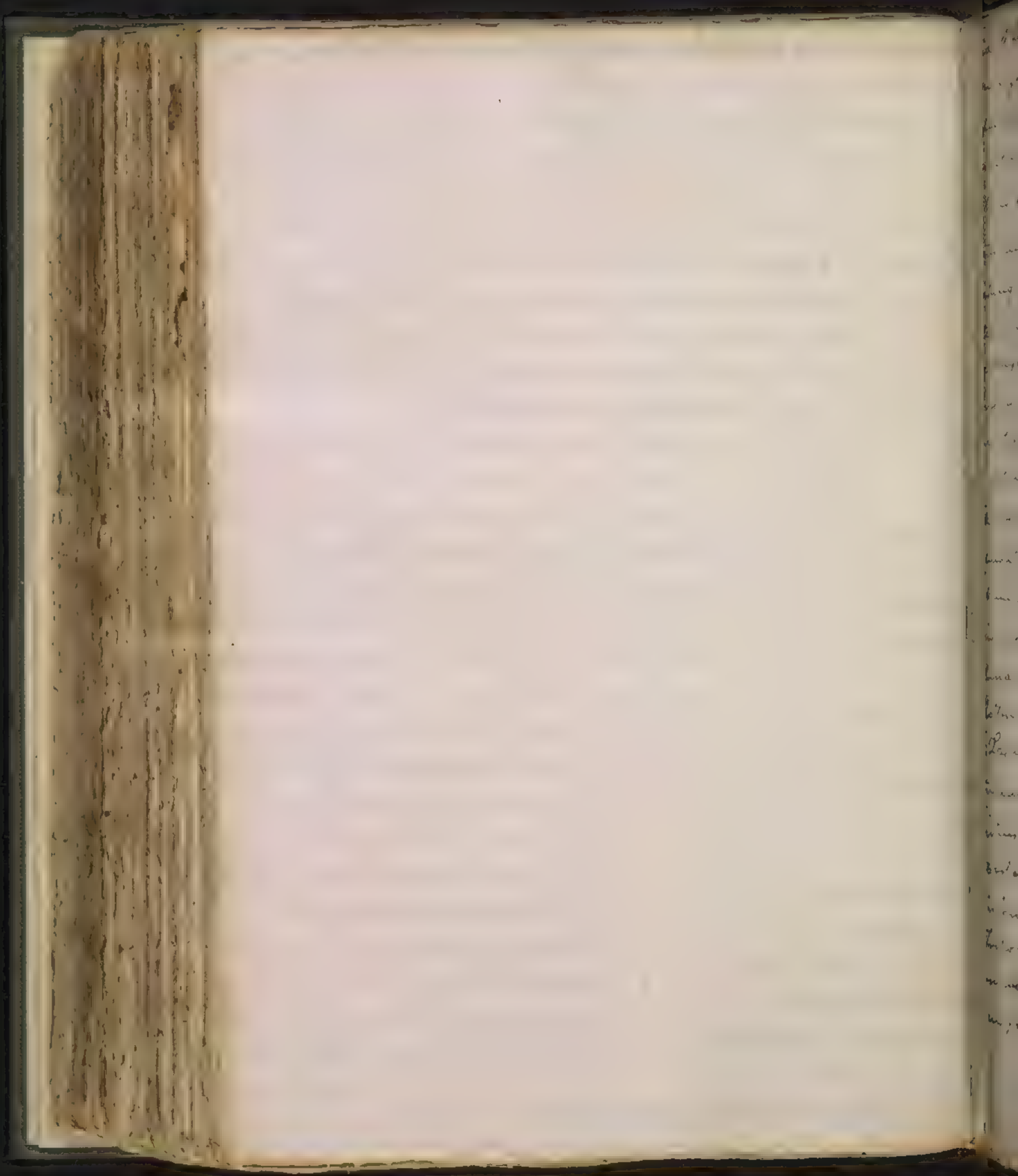
aluminum in its composition and it is also more stringent
It is found in strata of Rocks hence its name. Alum is found
in pyrites and is separated by fusion ^{solution} evaporation and then

crystallization. The Nitrous and muriatic acids act on clay
and form Epsom's salts the properties of which are not suffi-
ciently known. Clay unites with calcareous earths and sand

when these are combined in a certain proportion they render
it fusible. It also mixes readily with milk. When the prin-
ciple of inflammability separates as it does by exposure to air we
obtain an alum. It is frequently mixed with and colored by
mineral matters. It mixes readily with water and forms a

soluble paste. It has a remarkable attraction for water
As clay is of some importance we shall pay some attention to it
Natural history and point out the States ⁱⁿ which it is found
by nature or well as the best method of obtaining it from
rough matters. It is sometimes found mixed with inflamm-

able matter but seldom with any saline substance but the vitriolic
acid



acid. When mixed with sand it may be separated by a sieve. Iron is generally combined with clay from which it cannot be separated by fire or water. The China manufactory which was set on foot some years ago in this city failed because all their clay contained iron. Clay when combined with pyrites may be separated from it by water. It is used for making earthen vessels. The Bores are nothing but clay mixed with some metallic or inflammable substance. These clays are the Bores of round paints or Spanish Brown. To these belong the culinary stoneware or Soap stone. Rotten stone Lapis Serpent. and Trispoli stone. The Soap stone feels soft and greasy between the fingers, when burnt it becomes hard, evidently some of the ancient Busts were made of it and burnt afterwards for it would be almost impossible to give them a polish so fine as they have if they had always been of their present hardness. The Soap stone contains other matters besides clay and vitriolic acid or sulphur salt.

The Rotten stones are soft and crumbly.

The Lapis Serpent. is nearly of the same nature only it contains iron. Many fabulous stories are told us of its virtue in detecting the poison of a certain serpent in the East Indies, such as its falling into heres or women who is touched by a person who has been bit by it.

The Trispoli stone is only wood petrified it is used to polish. When we may add the humusatra or black mould on the surface of the Earth.



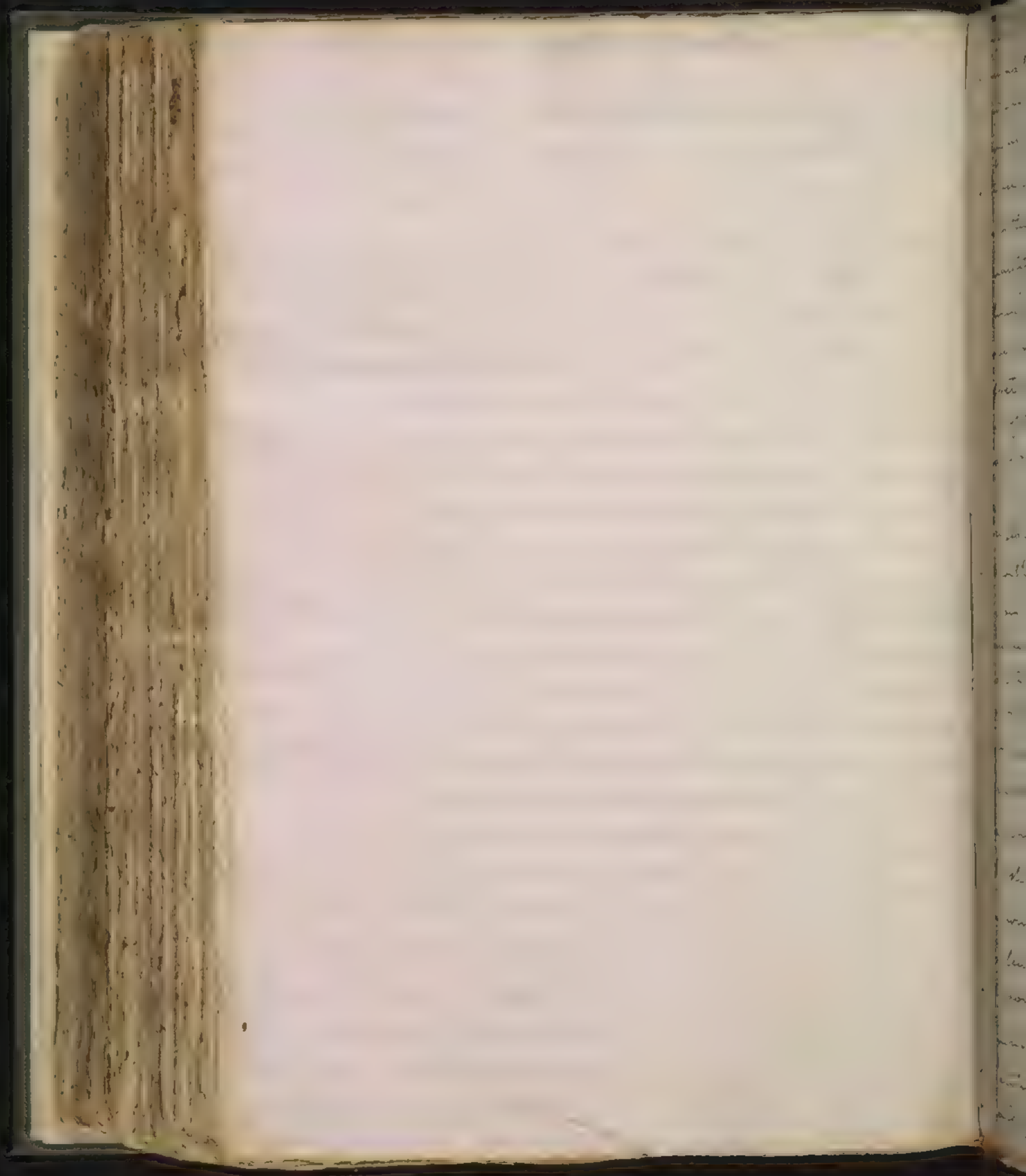
Inflammables

An inflammable substance is a Body which being applied to a burning body substance, takes fire and then removed continues burning till it is consumed entirely or in part emitting at the same time a Luminous vapor from its surface called flame.

The only exception to this definition is Charcoal for this will not flame. The Phlogiston or rather the ϕ is the same in all bodies, this is not destroyed but only dissipated by burning. The principle of inflammability resolves itself in light and heat. It cannot be separated from the body with which it is combined unless the air has access to it.

All inflammable bodies are divided into two kinds. 1st Those which are not dissipated from them until they are consumed 2nd Those which part with it before or Wood or into those that are not convertible into vapor till the inflammation has continued some time, and into those that are converted into vapor from the beginning or before all the principle of inflammability is dissipated from them. To the first class belongs Charcoal, Sulphur when combined with some fixed matter, and metals.

To the second class belong wood spirit of wine &c. Flame is only Vapor ignited, its conical figure is owing to the gradual consumption or to its being consumed as it rises, this conical figure is most evident in spirit of wine. The vibration of flame is owing to the agitation of the air. Spirit of wine burns only on its surface on account of the air only coming in contact with it in that place. Thus we see too is produced by an incomplete separation of the ϕ from Bodies with which it is combined. The violence



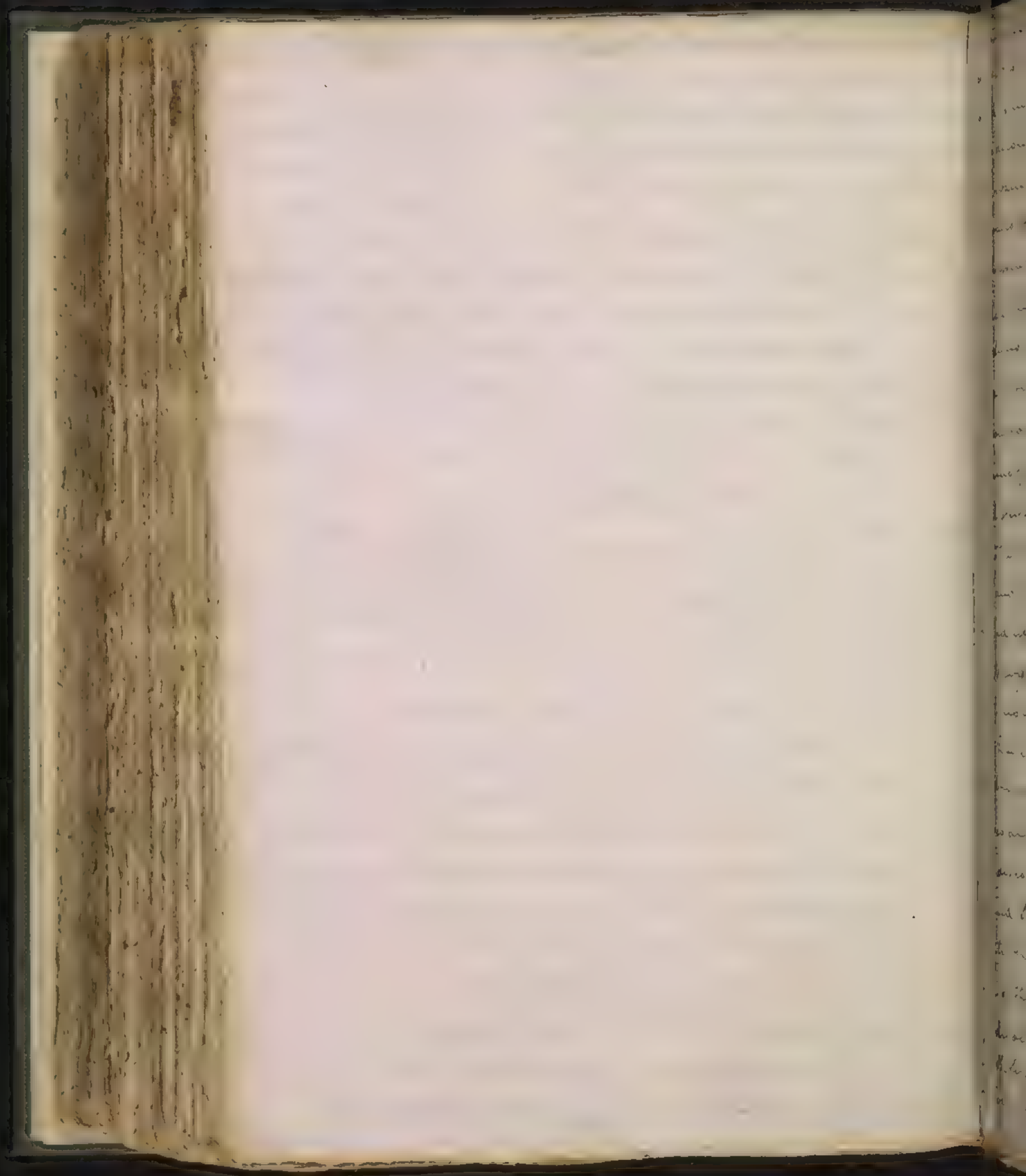
of the fire drives off with it some foreign and fixed matters
which adhere to the chimney. Soot is composed of the ϕ &
some foreign matter raised up by the force of fire and hence
is very inflammable. In proportion to the larger surface
of the burning body is the the Quantity of soot in propor-
tion to the smaller surface of the burning body the soot is in
its quantity as there is a more complete operation of the ϕ .
The principle of inflammability is never separated from
a body without producing either light or heat or both. This
is a fact that will explain many Phenomena.

Some of the inflammable bodies are not natural but pre-
pared by art but the properties of all are the same

Phosphorus

All inflammable bodies are called Phosphoric that emit
light without being put in contact with burning fuel.
There are 2 kinds of phosphorus viz Natural and artificial.
The nature and preparation of phosphorus were but little
known till within these few years.

Phosphorus is composed of the ϕ and a fixed matter from
which matter this principle of inflammability easily sepa-
rates in the ordinary heat of the air owing to the weak
attraction there never is in other and thus occasion
light. I shall confine myself to treat of the Phosphorus
from wine for the method of preparing it is not more
queer elements of Chemistry or Housework. It is so much
acted upon by the ordinary heat of the air that to preserve
it, it must be kept in Bottles closely stopp'd as it is other-
wise entirely decomposed and even then it burns with
a small flame which is owing to the Bottle not being
entirely



fully exhausted of air and it may emit light without
air. It is acted upon by some of the acids, when the vitriolic
acid is mixed with it an effervescence is produced and
it is decomposed without inflammation. The nitrous acid
also when mixed with it produces a great noise and
separates the principle of inflammability from its Basis
with great violence and heat so as to burst any vessels in
which the two are mixed together. But the muriatic acid
produces no change on it. We have no other accounts of
its action on earths. It unites readily with Sulphur,
the compound burns in a heat of 212 degrees of heat with
a flame of a yellow color if dissolved in water it emits a
fetid smell and imparts an acid taste to the water a proof
that both are decomposed. It dissolves readily in
oil and becomes more inflammable thereby if this is
mixed upon the hands and face they appear to flame
11. Wergroaf combined it with Copper and Zinc but
with none of the other metals. It is insoluble in water
and has no action on animal and vegetable substances
Phosphorus is formed by uniting the phosphoric acid with
charcoal in an intense heat, for the process is Lewis it
was discovered by Wergroaf. Kunkel's Phosphorus is
formed by 1 part Alum and 5 of vegetable matter the
vegetables are first changed into charcoal; the vitriolic
acid of the alum in this case unites with the ~~oil~~ the
gradual escape of which produces light and heat.
The Bologna Stone is a gypseous earth and is composed of the
vitriolic acid and a calcareous earth, burnt with charcoal
it

Handwritten text in a narrow column on the left side of the page, likely bleed-through from the reverse side. The text is dense and appears to be in a cursive or semi-cursive script. A small, isolated letter 'B' is visible near the middle of this column.

The main body of the page is mostly blank, showing the texture of the aged paper. There are very faint, illegible traces of text or markings across the surface, which may be bleed-through or extremely light handwriting.

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Phosphorus an intense heat is also necessary. This is only found in Bologna in Italy. It is remarkable that in Phosphorus the principle of inflammability is always joined with an acid. Phosphorus is of no use neither in medicine nor the arts. It only serves to entertain the Potentates of Chemistry many curious experiments may be made with it. Conceal Phosphorus in the wick of a candle hold it over warm water, it will take fire and communicate fire to the wick thus having the appearance of magic to those unacquainted with the nature of Phosphorus. As well also the following experiment viz. wrap some Phosphorus in tow with which cover a glass Bottle into which pour a quantity of warm water, or some cold water and then add some vitriolic acid (when cold water is used) and the tow on the Bottle will really take fire. A little warmth is necessary to facilitate the inflammation of Phosphorus hence it burns more readily in Summer than in Winter. Dr. Boerhaave has many curious relations of the effects produced by Phosphorus one in particular of the reformation of a young libertine produced by it which I shall relate in his own words. He is told says he that the governor of a certain Noble youth having endeavored by all his persuasion, but to no purpose to reform the dissolute manners of his pupil whereby he disgraced his Birth and ancestors, despairing of doing any good, he had recourse to a chemical stratagem which succeeded to his wish. As the graceful youth lay asleep in the warm chamber with his governor. The wick was

privately

25

privately in the night and upon a board within the bed
near the feet of the person, wrote his name in large
characters with English Phosphorus adding three other
words to admonish him to repent or die. This done
he retired privately to bed and making a noise room
after wakes the youth but none himself all the while
asleep, the other ~~start~~ startled with the noise
rises himself in bed and anxiously calls out to know the cause
of the feigned disturbance to which he received no answer but
feigned snore, till looking about, he sees with the utmost
horror the blue blazing letters, upon which he calls his
companion, and shows him the writing, who protesting
that he could see nothing helped to increase his fright
servants when then called to bring candles upon the op-
portunity whereof the letters disappeared, they too denying
that they saw any thing, he was at last surprised to find
the writing vanished. The servants quit the room leaving
the candles burning upon the board. The Governor
staying with his frightened disciple persuaded him
to go to sleep assembling what he had seen to himself
and retiring himself to bed, puts out the
light, but the poor youth no sooner cast his eyes upon
the fatal place than the same letters appeared anew
which occasioned a new outcry. His tutor here upon
begging himself frightened owns with trembling that
he saw the letters and takes that opportunity to advise
his
cause

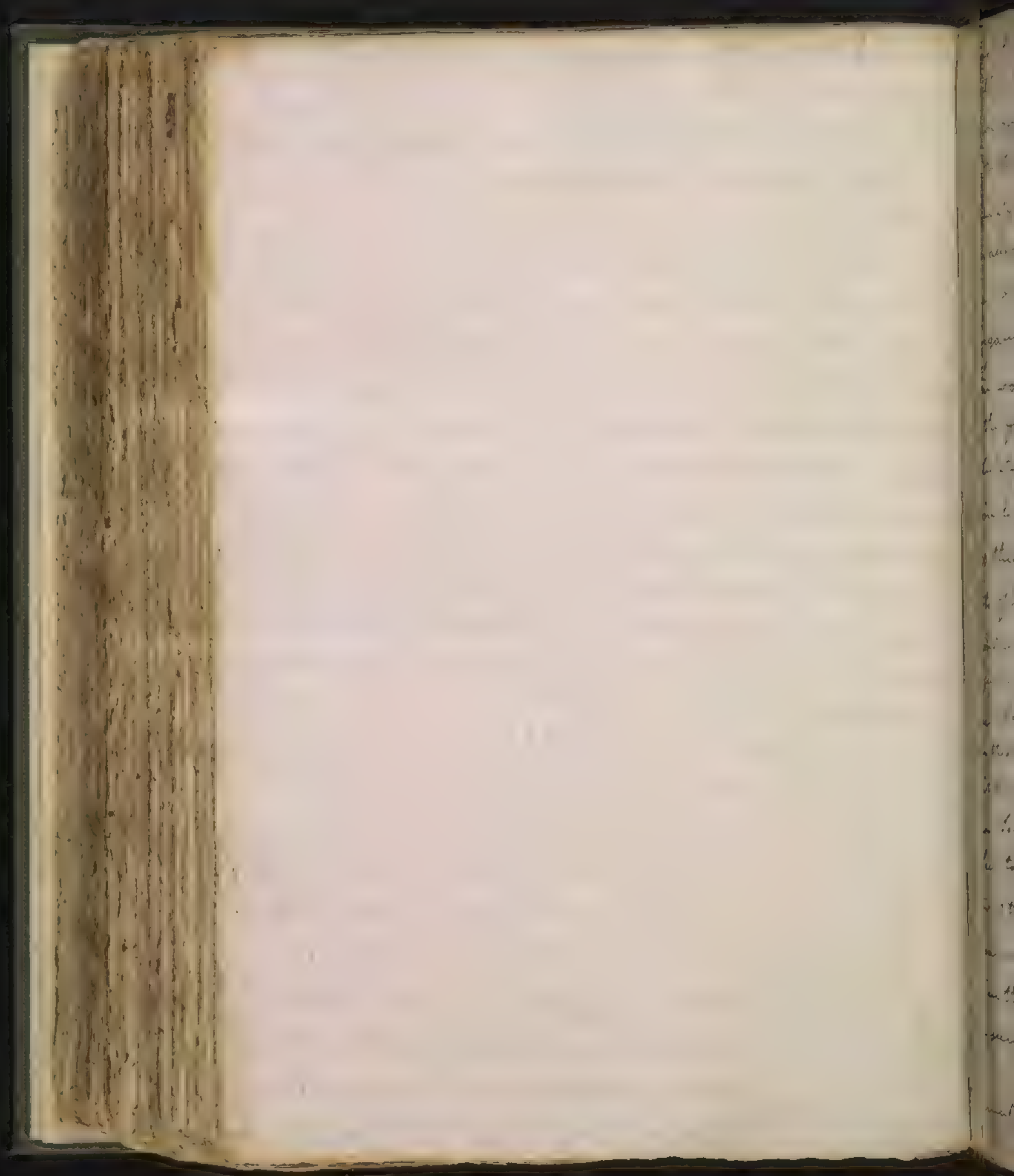
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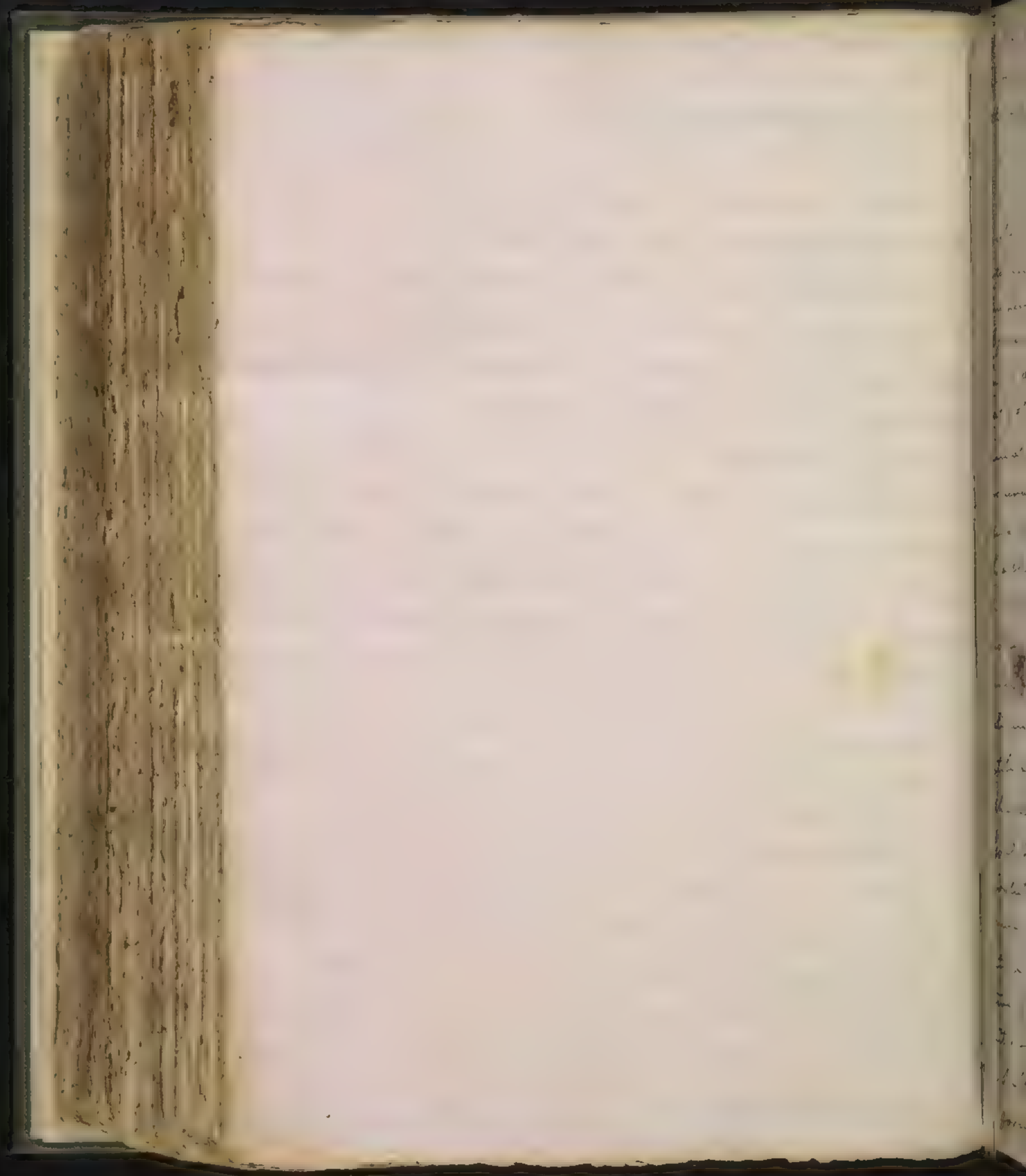
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his word to obey the miracle and repent in earnest, then
hanging in bands again, he removes him to another
room & sits up with him and thus recovers him.

Boethius also observes that if the shadow of a man were
placed in a dark room and a light is brought in, it will
be seen. But if the light is removed, it will be seen
that it may be moved over the face of a man's face with-
out injury. It then when washing the face with some
of it it will shine in the dark to the amazement
of the beholders, yet as soon as light is brought in to the
place the spectacle disappears, but taking away the light
the face will become luminous as before, from which nothing
can appear more surprising. The face of a man, his hair and
beard of a man thus are noted appearances. I am acquaint-
ed with the matter I know not how angelic or divine.
It is well to be acquainted with these things for when
Physicians fail us we can turn jugglers and show
a more after our needs or a more — a more
did I am a more knowledge of the matter. That I had
noted of the performance of the same
from what has been said we may account for va-
rious phenomena: the Meteors which we call shooting
stars are owing to nothing but the fire emitted suddenly
or gradually from some matter with which it is com-
bined which matters are so light as to float in the air.
The luminous appearances frequently observed
over marshes and grassy yards and commonly called
will with the Irish, seem to be owing to the same
cause.



basis. In the first case it arises from putrid vegetable matter, but in the latter from putrid animal matter & is thrown out of the grooves. The lustre of the diamond is owing to the gradual evolution of the principle of inflammability. It depends on the Rays of light for which the ~~it~~ is attracted from them for after being kept some time in a dark place it loses this property which however it regains by being exposed to the Light. Putrid fish and rotten wood give light from the same principles viz. the gradual evolution of the principle of inflammability. These woods must undergo the putrid fermentation before they acquire this property and we know that this is an entire revolution of the component parts of bodies consequently the ~~it~~ which is one of the constituent parts of wood ^{will} gradually escape. . . . and as all other insects of that genus give light from the same cause. There is a perpetual generation and continuation of the ~~it~~ in these flies. The females as we are told by Naturalists only seek the light and this when they want the males to follow them. Some have attributed the luminous appearance of the ~~it~~ to fermentation others to Electricity but . . . owing to either of these circumstances it should always be the case in the warm & good of heat in the same state of the weather and in the same Latitude, but in some places it has never been seen and at others it appears at . . . times around the . . . It appears to depend on a number of small animalcules floating near the surface I have lately heard that



that these animalcules have been discovered in the sea water
by a French gentleman. The light they emit is thought to depend
on the oil they contain.

Sulphur

Scarcely anything has been subjected to more chemical experi-
ments than Sulphur some supposed it to be the same as the pure
S and hence call all inflammable sulphureous. Dr Stahl
first found out that it was a compound Body, and that its
burning depended on the extrication & depends on the same S
as that of other things. Sulphur is composed of the principle of In-
flammability and the vitriolic acid. Sulphur melts in
a moderate degree of heat without flame if it does not touch
the fire. When the heat is raised or if it touches the fire it burns
with a blue flame and it emits fumes which are the vitriolic
and a little volatilized and are extremely hurtful. The acids
do not unite with it. The fixed alkalies easily unite with it
forming ~~the~~ Sulphuris which is soluble in water. The volat.
alkali unite with it with difficulty and not without the
volatile alkali is in a combined state forming the tincture
Sulphuris Volat. much recommended by Dr Hoffmann in
the gout. ~~Of this earth it unites only with the calcareous~~
This volatile tincture is made by combining Sulphur Sol
ammon. and Quicklime, the matter remaining after dis-
tillation is the Al ammon. fixum. We spoke in a former
lecture of the relation that Sulphur has to nitre. Of the Earth
it unites only with the Calcareous. Quicklime forms an
Sulphuris when united to sulphur which is much like
that formed by alkalies. It unites with some inflamma-
bles

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bles as oils forming those useful compounds the vitiated and
unburnt vitiated Boissons of Sulphur. If an over proportion
of Sulphur is dissolved in ^{oils} ~~water~~ by heat they will deposit first
when grown cold similar to the solutions of some Salts Spirit
of wine and Sulphur will not unite unless by making
this fumes meet where they will unite without digging. It
unites with all the metals except Gold Platinum and Zinc
mineralizing them destroying their lustre ductility and
malleability. Sulphur is insoluble in water in its simple
state, but it is soluble in water when combined with alkalies
It has no great action on animal and vegetable substances
living. It is found in all parts of the World particularly in
Italy which may be called a vast bed of Sulphur. Bishop Burn-
et in his theory of the earth thinks it very probable that at the
general conflagration the fire will begin in Italy, both on
account of the richness of that place and the great quantity
of Sulphur and other inflammable matters it contains
There are several different species of Sulphur 1st Pure Na-
tive Sulphur is found in greatest quantities in the Island
of Sardinia. Of the humerative sulphur there are several
varieties as first pale white in a crystallized form 2nd ~~of~~
Sage 3rd vitiated 4th in powder floating on the surface of
some mineral waters. 2nd Impure Sulphur is that which is
mixed with other matters as clay calcareous earths and
metals 3rd It is also mixed with Copper Iron and Zinc
in Pyrites. The Pyrites consist of Arsenic & Copper iron or when
mixed with Sulphur. The Copper gives the blue, the Iron the
green and the Arsenic the white pyrites. When the Pyrite is
exposed to the air the principle of inflammability escapes leaving

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leaving the vitriolic acid with the Copper Iron or Zinc forming green, blue, or white vitriol. The decomposition of Pyrites does not take place without heat and to this some have attributed the heat of mineral waters and to other quakes but of the more recent. The Sulphur used in medicine and the arts is generally procured from pyrites and from them in great quantities. Mandick is the same as Pyrites. Moraxites are Pyrites in Crystals. Wernicke in his Pyriteologia has the following observations. 1st The more Copper they contain the less Sulphur the more Iron the more Sulphur. 2nd All arsenical pyrites contain little Sulphur the more arsenic the less Sulphur 3rd In whatever pyrites we find Sulphur without arsenic we may expect to find Copper. 4th The more solid pyrites and the more we have to conclude that they contain Copper. Sulphur is found combined with the metals in the ratio of 100 with all except Gold, Platinum, Zinc, &c. Mercury and Antimony have the greatest proportion of Sulphur combined with them hence their metals are seldom found in an uncombined state in nature. Sulphur may be procured from Earths by simple fusion or sublimation, from the Pyrites it is got by burning for some Months the Sulphur collecting at the Bottom from whence it is collected for use. Sulphur is got from the Solfaterra by a process that amounts to simple sublimation & distillation.

Charcoal

It abounds with and is combined with a kind of the 4th fixed air, and is therefore embraced in our nomenclature

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no ϕ to other bodies and in restoring to the bodies of metals to
their metallic form. It is inflammable by the most intense
heat when confined in a close vessel, but if put in con-
tact with a burning body in the open air it takes fire giving
an intense heat and it is almost entirely consumed
losing a great part of its weight. This has been supposed to
be owing to its losing the ϕ but on the vapor which
arises is poisonous to animals and has the other quali-
ties of fixed air, we may suppose that the loss of its weight
is owing to its parting with its fixed air which is fur-
ther confirmed by its manner of deflagrating with nitre.
In nitre in this case is topped about at a given rate which
does not happen if a piece of sulphur is thrown upon the
nitre. It appears also that if a body of charcoal
should be formed of two such light substances as the ϕ and
fixed air, but this is one among many of the wonderful
effects of mixture. No acids or alkalies nor any of the objects
of chemistry produce produced any effects on it without heat
it is neither acted upon by water nor by air, pots may be pre-
served by burning the ends of them before they are put into the
ground this prevents their attracting the moisture of the
earth. If they are buried while green their decomposition is hastened
and the moisture is thus confined within the pores of the
wood. Another method of preserving pots is to lay them in
the ground in a direction contrary to that in which the heat
of the sun is received. For a short and pretty account of the method of
making charcoal see Newmans Chemistry pag. 463.

End of Part 2



Ardent Spirits

Ardent spirits include only those that are rectified and inflammable in the highest degree. They are called spirits from their being distilled and ardent from their being inflammable. Spirit was formerly procured from wines and therefore called spirit of wine; but we find now that it may be got from sweet vegetable juices that have undergone the vinous fermentation. Wheat raises it but produces no decomposition when it is pure. It contains an oil, acid and nearly $\frac{1}{2}$ Water. Spirit of wine contains less phlogiston than that of other substances. If set on fire it burns with a blue flame it ϕ remaining in the acid oil uniting fully to an acid. The contact of the air is absolutely necessary to the extrication of the ϕ hence the ardent spirits burn only on their surfaces. Spirit was supposed by Boerhaave to be the phlogiston again but it contains only a very small portion of the ϕ . No spirit of wine is perfect but it contains $\frac{1}{2}$ of water. Contrary to a former opinion I object that spirit of wine does lose a movement after being burnt, but that spirit which loses the smallest movement is the best. Another method of determining its goodness is by burning it on cotton, i. e. the cotton remains dry after the spirit is dissipated and may conclude that it is good. Another mark of its goodness is its setting fire to gunpowder this shews that the water is in so small a proportion as to be entirely dissipated. It then is formed by the union of the mineral acids with ardent spirits.

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Alcohol is most frequently used. Ether is very volatile it
has a pungent fragrant odor, it is perfectly colorless & light it is
as a spirit of wine it is so volatile and fragrant as to
diffuse its odor thro a whole room and it boils in the heat
of the human body. Were it not for the pressure of the atmosphere
it would always be in a state of vapor and probably it owes
its fluid form to the pressure of the atmosphere. Dr Bullen says
that in vacuo it will boil & vapor rises and boils on the
same principle as water does. Water boils in vacuo in a heat
of 100 Degrees less than it does in the open air and Ether, proba-
bly follows the same rule therefore as it boils in open air in
the heat of the human body it follows that in vacuo it
must boil at a heat below 0 of Fahrenheit. By its evapora-
tion a degree of cold sufficient to congeal water is genera-
ted. It is very inflammable and emits a considerable
vapor. We should therefore be careful not to bring the flame of
a candle or any burning substance near it lest the whole
should take fire. If a few drops of Ether are poured into a
vessel they will soon evaporate and fill it if a candle is
brought near it the whole will take flame. If a few drops
of Ether be poured on a lump of sugar and this put in
a tumbler of water, the Ether will gradually evaporate
from the sugar or it dissolves and floats on the surface
as it is of an oily nature and if fire is applied to it, it
will flame and thus give the appearance of water
burning. All Essential oils will burn in the same
manner.

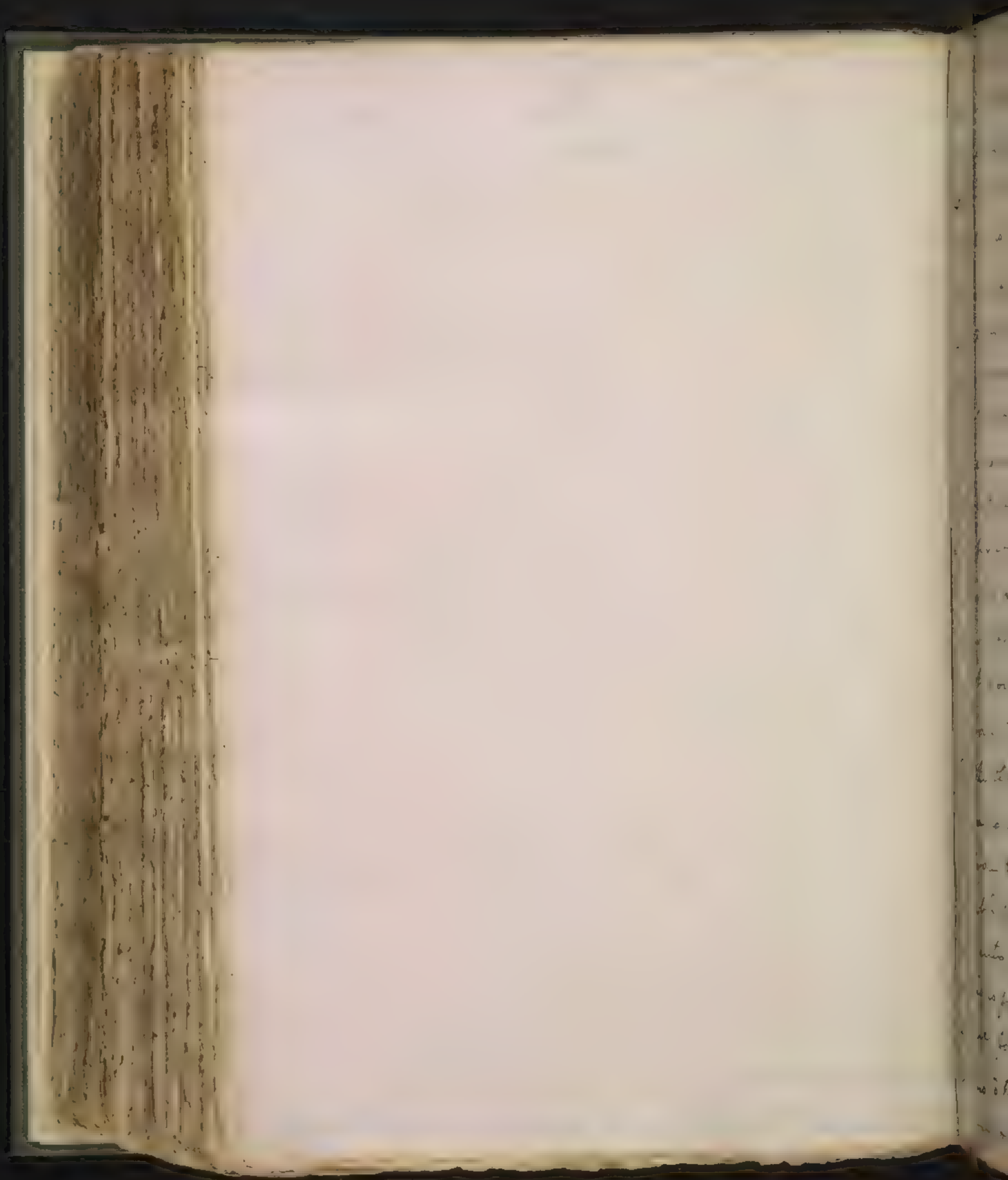
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manner... it may now be explained why upon stirring
one Pond from the Bottom ^{by} applying a flame to their sur-
faces they will have the appearance of burning fire, this ap-
pearance seems to be owing to the Vapor which is speci-
fically lighter than water and ~~is~~ is separated from
the earth swims on the surface and is inflamed like
other being like it an inflammable body. This me-
chanism when the color of the fire is black red, blue
wholly found in a black soil. It is very difficult to
conceive that it is enough to set upon any sub-
stance and hence we know the relation to
the other lights of Chemistry, the vapors rise from
it in a great quantity. The depositions in
the ether and swims on the surface. A little of it deposes
in water not more than one tenth of it. I have now
been directed to preserve it in water but it is necessary
to lengthen

the proportion of wine and vitriol
and making it less and for the reason
thence. I report of the vitriol acid, and of the
acid of wine is the proportion now used for ma-
king the vitriol acid: must be mixed pro-
portionally a muddy color is produced which is owing
to the separation of some aqueous matter from



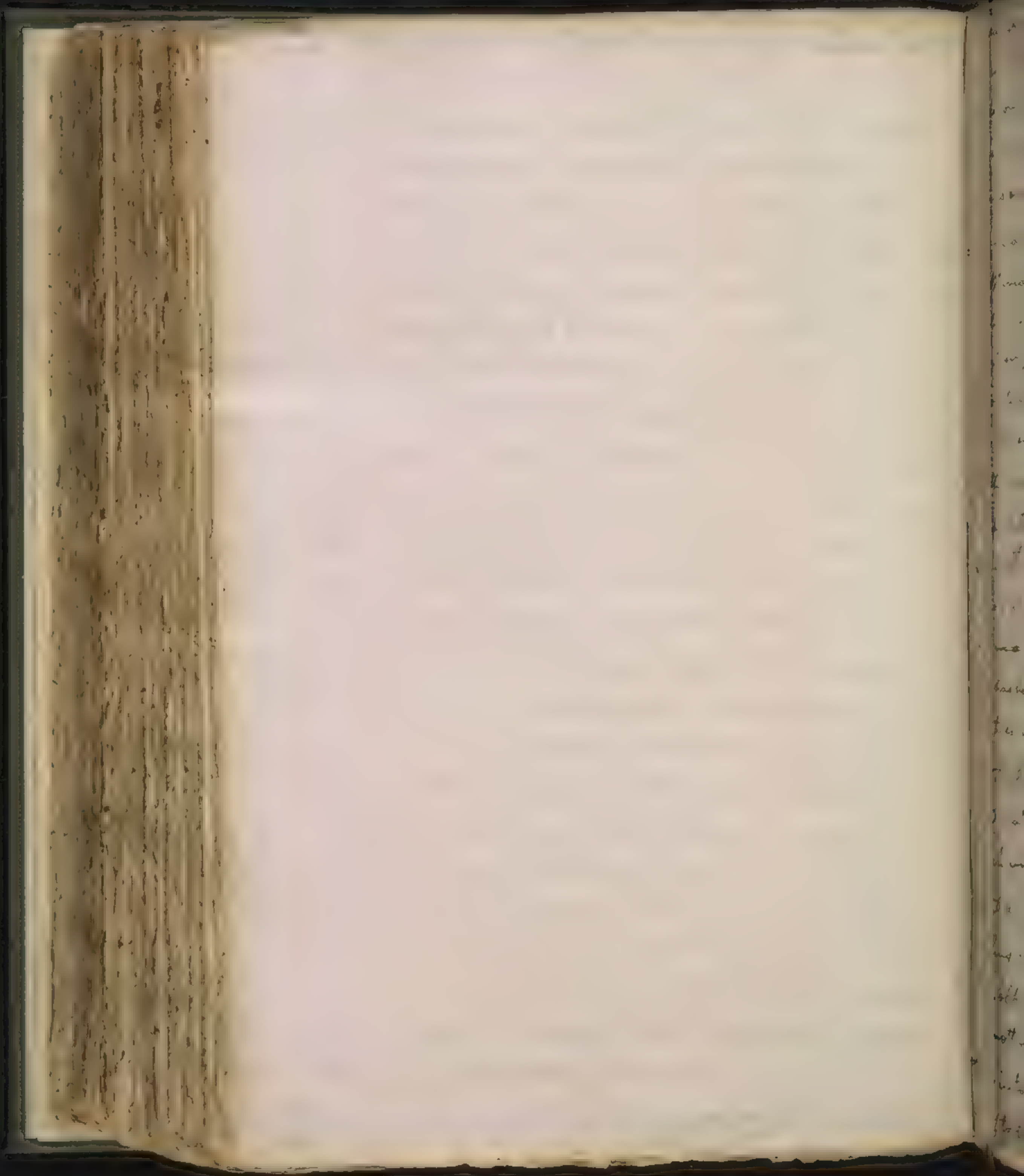
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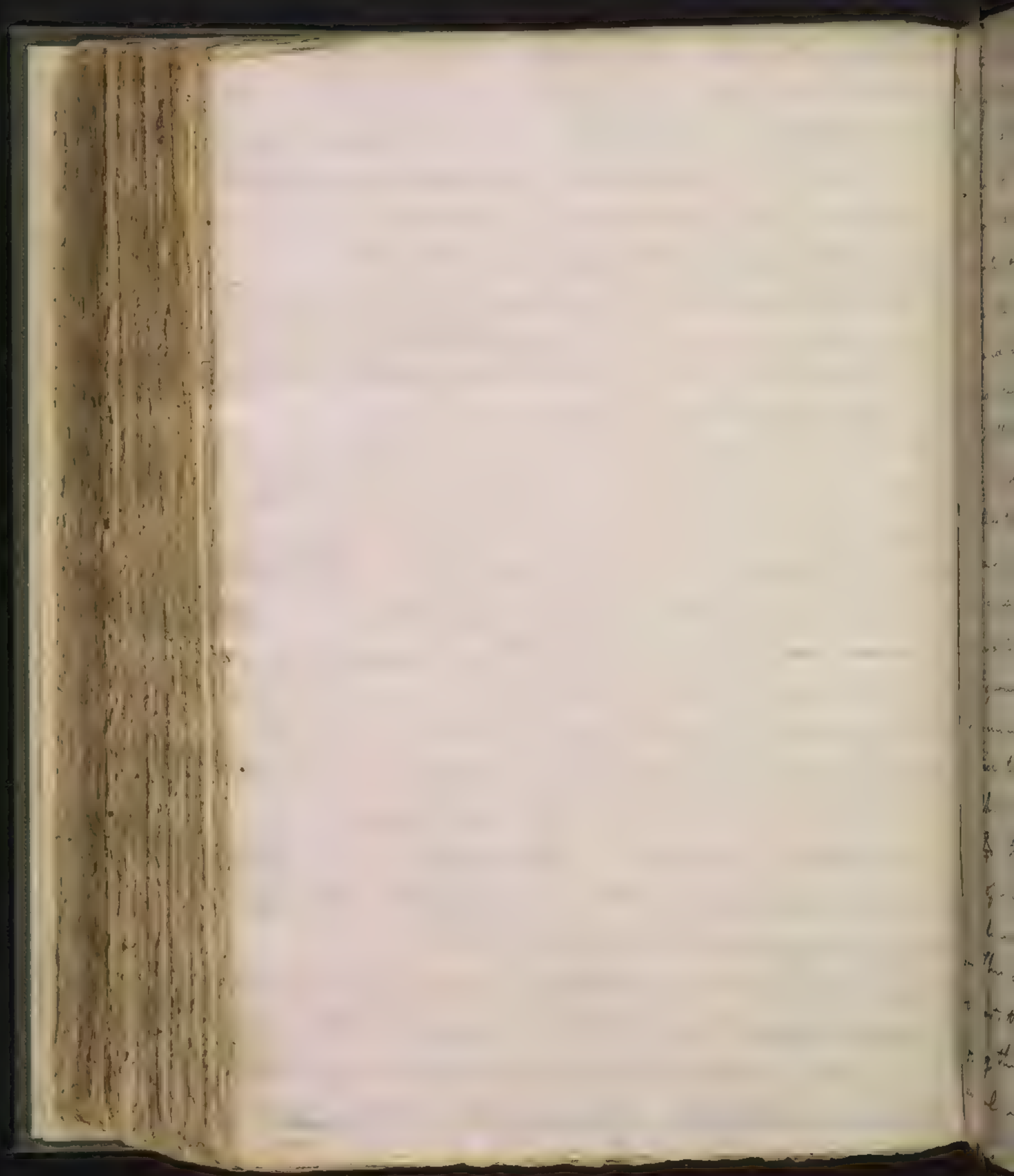
ances ~~which~~ were of our attention as they will illustrate
the action of this acid upon the metals. If a small quantity
of nitrous acid be poured upon spirit of wine a violent bulli-
um ensues its quality is changed and it emits a fume that
is like apples. The mixture afterwards boils and sends
forth copious ^{nitrous} fumes which are of great elasticity and force.
The nitrous acid when added to water produces a blue color
but it is only the feebly acid which has this effect. The more
the acid the more evident will be this blue color. This
is owing to the ϕ on which also its volatility depends
If ϕ may be imported to the acid if a few drops of spirit of
wine be poured upon a weak nitrous acid it will become
as strong as to produce the blue color in water. With
nitrous acid spirit of wine forms ether which is a ferment from
the vitriolic ether. It is made by mixing two parts of nitro-
gen with three parts of spirit of wine which by
mixture alone produces another in the cold. The ether floats
on the surface 24 hours after mixture. It does not require
distillation. How is the ether formed in this case? It can-
not be by abstracting the water from the spirit of wine be-
cause it has but a slender attraction for it. This seems to
invalidate our conjecture concerning the formation of
the vitriolic ether. Let us therefore venture upon a new
hypothesis or conjecture. It is not the nitrous acid be-
neutralized by the spirit of wine in the same manner as
previously is by fixed air? May not its energy be limited?
May not the language of giants be made dumb?



his danger is to make it more ~~other~~ on account of the
which arise on mixing them, this is avoided by
a contrivance which confines them. The Spiritus nitro-
is made by adding a small quantity of the
acid to a larger quantity of spirit of wine. It is of a
smaller degree of the fragrance of the other.

The Muratic acid will not unite with spirit. and in its
pure state even in its most concentrated state so, indeed is its
action for the principle of inflammability. The common
contrivance by distilling mercurius corros. sublim.
with it is combined the muratic acid with the tin and
the muratic acid being impregnated with the
mixed with the spirit of wine and formed a mixture
other with this forming Liquor of Laba vias. Mr. Wolff
is of opinion that this is more simple and therefore ~~more~~ preferable.
It has been for some time a fashionable medicine but has
no virtues different from those of spiritus nitri or Alkali
one. Hoffmanns mineral anodyne liquor of gum arabic the
nature as the vitriol in other and was formerly
much used in irregular motions of the nervous system
Lomb de Lauragais obtained a vegetable ether by
distilling vendeguis with spirit of wine.

The acid oil of lime dissolves partially in spirit of wine. The
best method of concentrating ardent spirits is to
throw into them Salt of tartor (in the proportion of 1 lb of
Salt of tartor to 10 lb of spirit) which attracts the water



It seems this preparation is used & here we are to take them to
the highest degree. The spirit of wine is apt to acquire a yellow
color and a rancid taste from these it may be freed by distil-
lation. The method is described very particularly by Boerhaave
He called it rancid spirit of wine. The alcohol should be
caustic as possible as soon as to these defects. Then when
it is mild, it is mixed equal parts of Spt. Vin and volatile
alk. and shake them well together they are converted into
a kind of solid mass, or may be a decomposition for the Spt. Vin
it attracts the aqueous parts of the alcohol which then
it changes to a gas and entangles the spirit of wine. This
is called the *Spiritus Aluminatus*. The volatile alcohol
and aromatic oils form. I can describe much more Spt. Vin
and volatile alk. to form a liquor rancid. Spt. Vin
acts powerfully upon some of the most powerful salts.
Spt. Vin is added to a solution of Glauber's salt the
salt is immediately precipitated. If it is added to a solution
of Vitriol test. it becomes a vitriolic ammon. in the first
place it becomes volatile by robbing the spirit of wine
of its Spt. All these salts that are deliquescent defer but in
spirit of wine. If the earthy substances it acts only on
lime and on this only in the state of solution. This
defers lies in spirit of wine abstracting its vola-
tile parts. This is thought to be a better method of free-
ing the spirits than by the alkalis. It acts upon
several inflammable bodies. It dissolves phospho-

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... is experienced in a ...
first discovered by ... metals that
reduces the ...
may ...
agitates in spirits of wine, the gold after some time separates
and floats on its surface. This is used for detecting the pres-
ence of gold in platinum with which it is frequently con-
fused. (See Lewis Philos. Commerce of arts page 485 Art 9
Part 3 Experiment 10) Limb of wine bleeds tornished
gold leaves and bleeds better than red tartar. It is used to
rubbed on it with a brush. This has been a great secret. To
it out by simply defolowing the dirt or by restoring to the gold
the ... We shall consider this in dry here after. It has a very
strong attraction for water even the sum of it contains
water. It loses its ... unless well worked. It preserves
animal substances from putrefaction. Its action upon
vegetables we shall consider hereafter when we come to treat
of wine. The coldest air will not freeze spirits of Wine.
Warm air expands on these properties depends its use in
making thermometers.

It may be obtained from all vegetable substances that
are capable of undergoing the vinous fermentation
from their wines or rather it may be obtained from
spirits of all kinds by distillation.

Airs

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most oils when it has been lost by distilling & in a water a
line of agnate oil rises into the receiver & the oil in air
in the retort or still is of a carbonaceous nature. These
oils take fire easier than the mucous oils.

20
The vitriolic acid unites with the oils with heat causing
it to emit fumes. The nitrous acid unites with them with
great violence and is united to the Al. Benzophor
or Al. Turbith it bursts into flame. It succeeds better if
a few drops of the vitriolic acid are added. The muriatic
acid only darkens their color and produces no heat or
flame. The vegetal acids, when mixed with the oil of
the cocco do not form the same as the others, although
they are all soluble in the oil.

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The first thing I noticed when I stepped
 out of the car was a warm, sticky
 air. The humidity was oppressive, like a
 heavy blanket. I had heard that the
 weather was bad, but I didn't realize it
 would be this bad. The sun was
 beating down on my face, and I
 could feel the sweat starting to
 trickle down my forehead. I
 looked around at the other people
 who were also struggling with the
 heat. Some were wearing hats, some
 were drinking water, and some were
 just wiping sweat from their faces.
 I felt a little better when I saw
 the hotel. It was a nice, air-
 conditioned place with a pool. I
 went to the pool and sat under
 the umbrella. The water was cool
 and refreshing. I closed my eyes
 and let the sun dry my skin. It
 felt like a warm blanket. I
 opened my eyes and looked at the
 sky. The sun was still there, but
 it felt like it was a friend now.
 I smiled and took a deep breath.
 The humidity was still there, but
 it wasn't so bad anymore.

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to its effects as a medicine and discuss it to, for the
reasons in its property of resin in how it is prepared in the
form of the resin in the oil, and in the oil, and in the oil, and in the oil,
the other resins except the oil of the resin, and in the oil, and in the oil,
contains more resin matter than the resin is obtained from
the growing in the Island of the resin, and in the resin, and in the resin,
It likewise grows in Virginia and South Carolina, and in the resin,
is dissolved in oil of the resin, and a little water be added the mixture
becomes white and is called Virginian milk. It is found
all be purified which is the only safe preparation
we are acquainted with it softens and whitens the
skin. The use of it is commonly used in the
medicine to cure the skin and enliven the health.

Resins and Balsams are both aromatic oils differing
only in consistency; the Resins being in a solid the Balsams
in a fluid form. The consistency of Resins is owing
to their acids and in containing more of this they differ
from the aromatic oils. They afford by fire a small quantity
of water in oil and an acid of a vegetable nature, they
leave a large quantity of carbonaceous matter in the
residue. This sort of resin is called Black which is chiefly made in
Sweden. It is made in Sweden from the Resins of the pine
and fir trees the all the other Resins will yield it. It is only
the resinous parts of the resins which yield it. It is
called Black Resins and Balsams and soluble in the mineral
acids; they dissolve in spirit of wine forming varnishes, and of
the Resins with V form varnishes which are called

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dry varnishes from their drying very quick after being spread
upon any thing owing to the evaporation of the spirit of wine
they dissolve and form varnishes with aromatic oils which
are then supposed superior to those formed with V.
The oil of turpentine is most commonly employed for dis-
solving them but the oil and spirit both evaporate
and leave the resin behind. The resins and Balsams have
no remarkable action on Earths and metallic Substances
When they are uncombined they are insoluble in water, but
are made soluble by Gum. Arab. &c. They are soluble in
alcohol in proportion to the Gum combined with them.
Resins. The Resins are all obtained from trees, for an
account of their virtues &c see most of the Books of Chemis-
try Hist. Med. &c. There are sometimes found herb plants
combined with the resins.

Mucosities

These are perfectly bland smooth and slippery to the feel.
From their being slippery they are of use in slipping frictions.
They do not differ in their specific gravity as the essential oils
but are all float on Water they are inodorous and all
are perfectly fluid and appear solid. The effects of heat on them
show that they are not the aromatic oils, they are not converted
into vapour so easily exposed to a small degree of heat they
become thinner when the heat is raised to the boiling point
a water & crackling noise ensues which seems to be owing
to air or water escaping from them. They boil at
of four hundred thermodimeters. When the heat is raised to
four hundred they smoke at 600 they emit steam which
taste?

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at first when in contact with a burning body.
mixing themselves in a water mixed with an
acid is a first leaving behind a dark viscid oil called
pyromastic oil and a carbonaceous one is more
viscous in the water. The pyromastic oil is more
volatile and inflammable than the mineral
oil. Pyromastic oil is more deprived of its inflammability
than the mineral oil. The mineral oils
mix with the mineral acids without heat or effe-
rescence. The mineral acid forms with them a carbon-
aceous matter. On the addition of the mineral acid
it is converted into a substance resembling Pomatum.
The reason why the mineral acids do not act on them
with a great deal of violence is that their principle of
inflammability is filled with other matters. They have
a strong attraction for fixed alkalies and it is by their
union with these alkalies that soap is made. The
Manufacture of Soap is of some importance. I will make
a few observations on it. In making soap we should
employ either the vegetable or fixed alkali and either
an animal or vegetable oil. The best soap is made
in Spain France and Italy but as the greatest quan-
tity is brought us from America since a third of
it is brought us from America. The oil of olive
coming from the Mediterranean is called Castile or
Spanish soap. They use a vegetable oil the oil of olive
and pour on an alkali by dissolving the ashes of the
Kelp or Keli. And this of ancient time is added to the oil
to make it caustic by absorbing the fixed air. It is boiled
until it is thick.

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The oil contains at least 10% of the same as
the two next, but it is much more than the
other two, and it must be long as it continued to
increase the oil and it is of the same nature
must be owing to the nature of the alkali to which it
now can be added either by such means or so as
anti-fossil alkali then softens the oil and makes it
set upon the oil. To harden the soap add 4 or 5 bushels
of oil salt to 1200 of the soap. The salt attracts and
dissolves in it the impurities in water & the by and by
the bottom of the oil. The same alkali attracts the oil
and for a solid hard concrete the hardened part is to
be taken out and cut with a wire. The green color of the
castle soap is owing to the green color of the
oil between the soap made here and the castle soap
consists in two particulars, that the castle soap is composed
of a fossil alkali and vegetable oil whereas this made
here is composed of an animal oil and vegetable alkali.
The inferiority of our soap is owing to our using an oil
and instead of a vegetable oil. The vegetable alkali is
not inferior to this but it is the oil or the oil found
from the oil. Provided the veget. alkali is extracted with
sufficient care. In this country an oil may be
procured from the same flower which would make
soap equal to that of barilla or castile for the method
of extracting the oil in the process of the American
philosophy is done by Pot. 1st in paper By Dr Morgan
The alkali has its acrimony much blunted by the oil
like the vitriolic acid in Alum it is not perfectly neutralized
here it unites with oil and bonds of all
kinds.

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linds since soap is used in bleaching and scouring linen.
Harts from the alkali it contains on the mucous parts of
the human. The Cortex oil or that obtained from Rhus
would equally answer. The mucous oils unite with none
of the earths but sometimes and form a compound so much
resembling soap as to be soluble in water. They unite with
volatile alkalies both in a mild and caustic state and
the oil becomes thicker by this union. They dissolved in oil
forming Balsams of sulphurs and insoluble in water and
on the calces of lead have been used and there combined frequently
in the common plasters of so but do not act on iron, hence
the practice of anointing iron utensils with oil to prevent
them from rusting, the oil preventing the action of the
air upon the iron. They are insoluble in water except
by means of mucilage as the white of an egg. They
will preserve animal and vegetable substances from
putrefaction and thus eggs will keep a year when
dipped or buried in Tallow or Hogs lard.

The air acts much on the Mucous oil, making
them rancid so Vegetable oils contain a mucilage which
ferments, this therefore turns putrid rancid oil, but
by washing may be made sweet again as the mucilage
is soluble in water. Thus oil and butter grown
rancid may be restored to their original sweetness by
washing. As moisture is necessary to fermentation the
oil or butter which contains least water will keep
sweet longest. Thus the oil Men in London preserve
sweet oil by throwing a spoonful of salt into the
flesh, the salt uniting with the water contained in
the

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the oil falls to the bottom leaving the oil pure without mix-
ture with it. In the same manner salt & sugar butter
by acting on the mucilaginous part and so on the oil, for we
find always whole lumps of salt in the butter which is a proof
that the salt does not dissolve into it. Upon the same principle
applied to the want of moisture it is that butter which
has not been worked with water from the butter in it
will keep longer sweet than that which has
been. They are contained in small cells in animals and
vegetables. The vegetable oils are chiefly contained in seeds
of plants and are obtained from them by boiling or expressing
and are called expressed oils whereas the aromatic oils formerly
by treatment of are called essential oils. The seeds from which
expressed oils are obtained are first triturated. The aromatic
oils are generally in a solid state than the made
liquid by heat. They are strained thro' a woollen cloth
in obtaining them. Along with the mucous oils we may
rank Spermaceti Wax and Lac. Spermaceti is a
solid brittle substance with a gray feel. It melts
or becomes fluid below the boiling point of water. It
has a flaky appearance like tallow. It hardens in a
moment and like the metals has no intermediate
state between fluidity and solidity. It hases no
caput mortuum upon being distilled. It is not so
inflammable as the mucous oils hence it is
used in making candles. It is not much acted
on by acids or alkalis. It unites with mucous
oils. It is insoluble in water and spirit of wine
but

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is dissolved in water by means of emulsion. It is
mixed with water. The emulsion is prepared
by adding equal parts of sugar and spermaceti
this is a good medicine in Coughs and Catarrh. Sperma
ceti is obtained from the brain of the whale dentatus (the
Physalis Macrocephalus of Linnaeus). It floats in the
head of the whale with a quantity of oil from which it
is separated by boiling straining. Wax is an animal
substance. Lac is an inflammable substance with which
it forms a varnish. It is soluble in spirit of wine with which it forms
an oil varnish. It is an animal substance found
on certain shrubs.

Bitumens

These are inflammable mineral bodies, they vary ac-
cording to the quantities of acid and principle of inflamm-
ability they contain. They are divided into fluid and
solid. Of the first is Naphtha which is a light fluid
solid. Of the second is Asphaltum. It consists of a thick
body and is very inflammable. It converts itself into
a fluid. It is remarkable that it will not take fire from
the sparks produced by the collision of flint and steel
Thompson a steel wheel is made to strike on flint stones
in mines to give light to the miners as the Naphtha is
common in mines. On the contrary gunpowder will
not take fire with a flint.

Petroleum is a liquid bitumen, obtained in France Italy
and Germany. It is a light inflammable substance issuing
from rocks and floats upon the water. It was by means
of this substance that the ancients were enabled to
burn their enemies ships, for it will take fire while
floating.

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... Water and burn with a gentle flame in some towns
... it is common to strew (the same) upon some earth in a mortar
and rub fine to it, it burns gently and emits a rather pleasant
burning is increased by covering the earth

The Mountain Tar is much like the petroleum only some-
what more inflammable. It is also called Barbadoes Tar
because it is most commonly found there viz in the Island
of Barbadoes. Of the total Petroleum is

Bit coal in Lewis has discovered a substance composed
of bit coal and Tar which will remarkably preserve wood
when covered with it it has been applied to the preservation
of ships and tops of houses

Ranch Coal is the most inflammable. It may be polished
it and formed into Buff Boxes Kilkenny coal burns
without flame.

Amber is of a yellow red color and is transparent. It is
found on the coasts of all countries. It is now
found it seems to have been once fluid from the fires
under it it contains within its substance, it was proba-
bly of a volcanic nature.

Ambergris is made of the same color of wood it seems to come
out of Camwood. Its relation to the objects of pharmacy is similar
to that of Amber. We now come to speak of their application
to pharmacy and first of Sulphur. Sulphur has been given
when an injury is or morbid acrimony of the blood has
been supposed to exist. I would make objections to this
Sulphur is insoluble in the juices of our body which are
of a watery nature therefore it never enters the Lacteals
and even supposing it to enter into the Blood it does not
sweeten...



purify it or purify it. The action of sulphur is entirely con-
fined to the prima viæ it never enters the blood. To prove
that it entered the blood it has been alledged that persons in
the use of it have had their silver watches discolored: this
has been thought conclusive but probably is owing only
to some air which has unwarily escaped from the intesti-
nal canal. It is undoubtedly a very gentle safe
bathastic and is very useful in the Piles. It is an in-
gredient in most ointments for Eruptions on the skin
particularly the Itch.

Sulphur has of late been much used in medicine. It is a
powerful sedative and antispasmodic hence it is given
in spasmodic affections of all kinds particularly in
the Gonorrhea stomach. It is employed as an antispas-
modic both externally and internally. Externally
it is used in the Head each a tea spoonful is to be
poured on a piece of Cotton this is to be applied on
the part affected and to be covered with a bladder.
We shall have occasion to mention the Sulfur
the oils so frequently mentioned here. I shall omit
speaking of them here as to their Pharmacologi-
cal applications.

Metals



Metals

These are shining, opaque bodies not inflammable, not soluble in water, of great specific gravity, which when exposed to a certain degree of heat melt and when cold return to their former state over on electric and the best conductors of the electric fluid. To these properties some add malleability and ductility but these do not belong to all but to some particular ones only. No part of Chemistry affords us more instruction and entertainment than the metals and none of the objects have been better investigated. We shall make here a few preliminary remarks on the general effects of heat and then turn on the Metals and here we shall be very general indeed and not take notice of any particular exception till we treat of the particular metals. All the Metals will melt in different degrees of heat in proportion as they are more or less volatile. They are all composed of the ~~fixed~~ ^{fixed} and some fixed matter. Their splendor, opacity, ductility, malleability fusibility and their non electric property depend on the principle of inflammability they contain. From the abstraction of this principle they are reduced to the footing of common earth. The fixed matter which remains after the ~~fixed~~ ^{fixed} is abstracted is called a calx. Some its appearance resembles to quick lime, because it is that it may be reduced to powder: but it differs from lime in the following circumstances. That the calx of lime or quick lime may be obtained in a confined place that the calx of metals can only be procured when they are exposed to the open air. Metals do not readily part with all their ~~fixed~~ ^{fixed} in the fire in vessels open according to the gravity.

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quantity of it that they have lost. The more of the principle
of inflammability they lose the more inert they become
in the combustion, the more of it they retain the more they
approach to the full combustion of these metallic bodies
for some burn with ~~so~~ readily a few do not burn with
it in the most intense heat we can apply. Some when
heated emit light and heat some heat without light.
All metals become heavier on their conversion into Calxes. Thus
100 lb of Lead will after Calcination weigh 112 lb. Some
have attributed this increase of weight to the metals attract-
ing the particles of fire which they supposed to be of an acid
nature and by this they explained the Calcination of some
told by ~~fire~~ acids but later experiments in Chemistry
found that this increase of weight is owing to an absorp-
tion and concentration of dephlogisticated air from
the surrounding medium. Another opinion has pre-
vailed was that this increase of weight was owing to
the loss of the ~~so~~ ^{phlogiston} ~~phlogiston~~ ^{lost} but they at the
same time attract dephlogisticated air. As a proof
that the increase of weight is owing to dephlogestica-
tion air being attracted 112 lb of the Calx of Lead will
yield just 12 lb of dephlogisticated air or the exact
weight they gain in Calcination. All the acids act
on the metals and their calces a Calcination taking place
and forming Salts which will crystallize these salts are
called metallic Salts. Some metals are only dissolved by
the acids, this is called Corrosion. Some Metals are
acted



and the following
1st Fixed as: may be extracted from the bodies with which
it is combined then longed in water. It is then
longed out from the water only when in the open air the
dried as in inflammation

2nd All Substances that react with fixed air become lighter
when no metals when calcined become heavier than before
3rd Fixed air will not reduce metals like the Δ fixed alkalis
precipitate the colors of metals from their solutions in
acids but produces no change upon them. But if one
metal is used to precipitate another the color of the
precipitant unites with the acid and its Δ worth
the color of the precipitate which is reduced to its former
metallic state. I know to this one objection will be made
Mr Pott of Berlin tells us that upon exposing the gold to
acid with black or. Lime to the action of the fixed air lead
was reduced to its metallic state now it may be supposed
that

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that the chalk or lime unhardened fixed air to the metal but a little
exposure will show us that it is owing to a different cause
fixed air or as it is by some called ~~phlogisticated~~ ^{phlogisticated} air is com-
posed of ϕ and vital air united together or as we have pro-
ved before, when the vol of lead and chalk or lime are mixed
together and exposed to the action of fire, the fixed air unites
with decomposition the vital air is dephlogisticated the ϕ unites
with and reduces the oxide of the lead. But

4th That the effervescence of metals does not depend on
fixed air Lavoisier made the following experiment
he exposed a quantity of the volatile alkali to the vapours
mercurial fumes during its effervescence with acid
air and found no change produced in the alkali
and that it was not rendered mild or it would have been
had fixed air been discharged. But even if it had been
rendered mild it would not have been so, ^{proving} that
the effervescence of metals depends upon the nature
of the fixed air for the ϕ might have united with
the vital air and thus have been converted into fixed
air before it reached the alkali

5th The phenomena accompanying the Effervescence
of metals are different from those accompanying the
effervescence of alkalis. The metals effervesce differ-
ently with different acids, they attract acids differently.
The vitriolic acid when combined with them forms
with their ϕ a Sulphur. The nitrous and muriatic
acids extricate an inflammable substance from
the metals. No such phenomena occur in adding
acids

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acids to alkalies or vice versa. What about off metals
not metals, not with these in presence. it is not
only the metal becomes heavier but the metals and
acids when weighed together are found to weigh more
than they did before. Dr. Black proved this by a simple
experiment, he took 2 half ounces of silver and 2 in-
ches of the nitrous acid. he suffered them to stand
some time and found they attracted nothing from
the air he then cut the silver into small pieces and threw
each half once into an ounce of nitrous acid after
some time he found the one weighed 14 grains the other
it and $\frac{1}{2}$ grains heavier than it did before. The reverse
takes place upon the addition of an acid to an alkali the
alkali here is found to weigh one fourth less than it did
before.

Compounds formed by a union of acids and Metals
and in general called Volatile Caustics. Atomic Phi-
losophers tell us that it is owing to the peculiar of the
acids obtaining momentum from the heavy parts
of the metals according to this notion the heaviest
metals should give the most caustic preparations
but this is not the case as Lead gives the least cau-
stic compound with an acid tho it is one of the heav-
iest metals. Metals may be separated from their solution
in acids by gentle heat by alkaline salts by spirits of
wine and by anhydrous or essential oils. Metals when
mixed with each other have a double elective attrac-
tion

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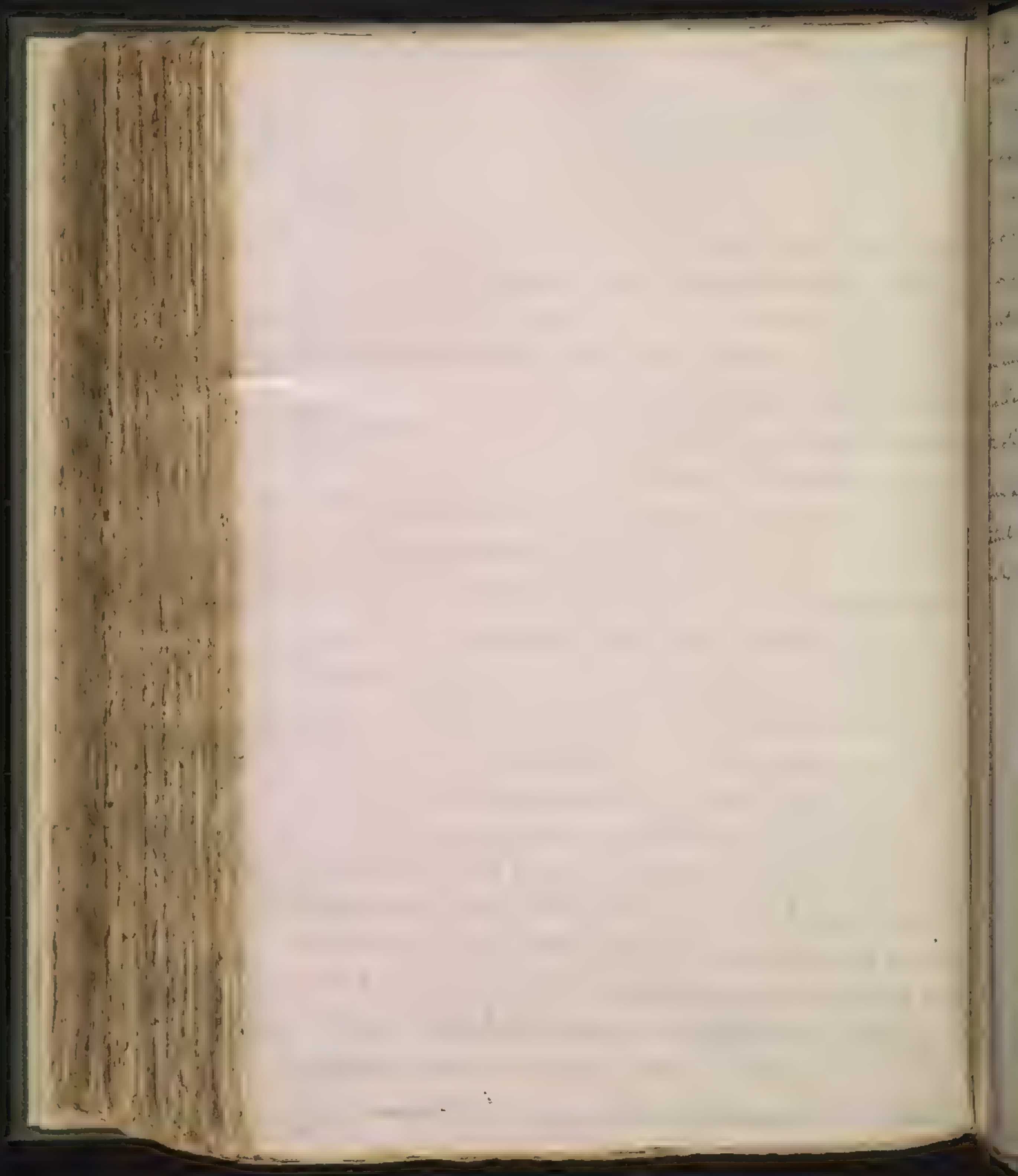
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metals are fused. The base of the metal is dissolved with the acid
and acts with the value of the precipitate. The action is
not entirely on the metal but on an union with them. Their
action is rendered more sensible in acids. The metallic
action is in proportion to the strength and quan-
tity of the acids they contain. Neutral salts render them more
futile without mixing with them. Borax is most use-
ful for this purpose. Thus in soldering Borax in powder is
put on the ends of the metals to be united and then
only melted and the heat applied and by using applied
each other in that state everywhere with ironings
Borax is useful in fusing metals in crucibles. The use
is so bright sometimes as to render it the heat and
thus prevents the fusion. In Borax forms a medium
union transmits the heat and this obviates this in a
convenience. It also dissolves the earthy matters com-
bined with the metal and thus suffers it to form a
uniform mass. All the other neutrals act in propor-
tion to the strength of the acid they contain. The
neutral salts formed with the nitrous acid act on
the $\frac{1}{2}$ of the metals. Silver, copper, iron, tin and lead
of antimony thrown into a crucible with nitre
will produce a violent deflagration. That the de-
flagration depends on the $\frac{1}{2}$ is evident as nitre will
not deflagrate when thrown into the crucible alone.
The acid is separated with the $\frac{1}{2}$ and the whole re-
mains with the oxide of the metal from which it may be
separated by



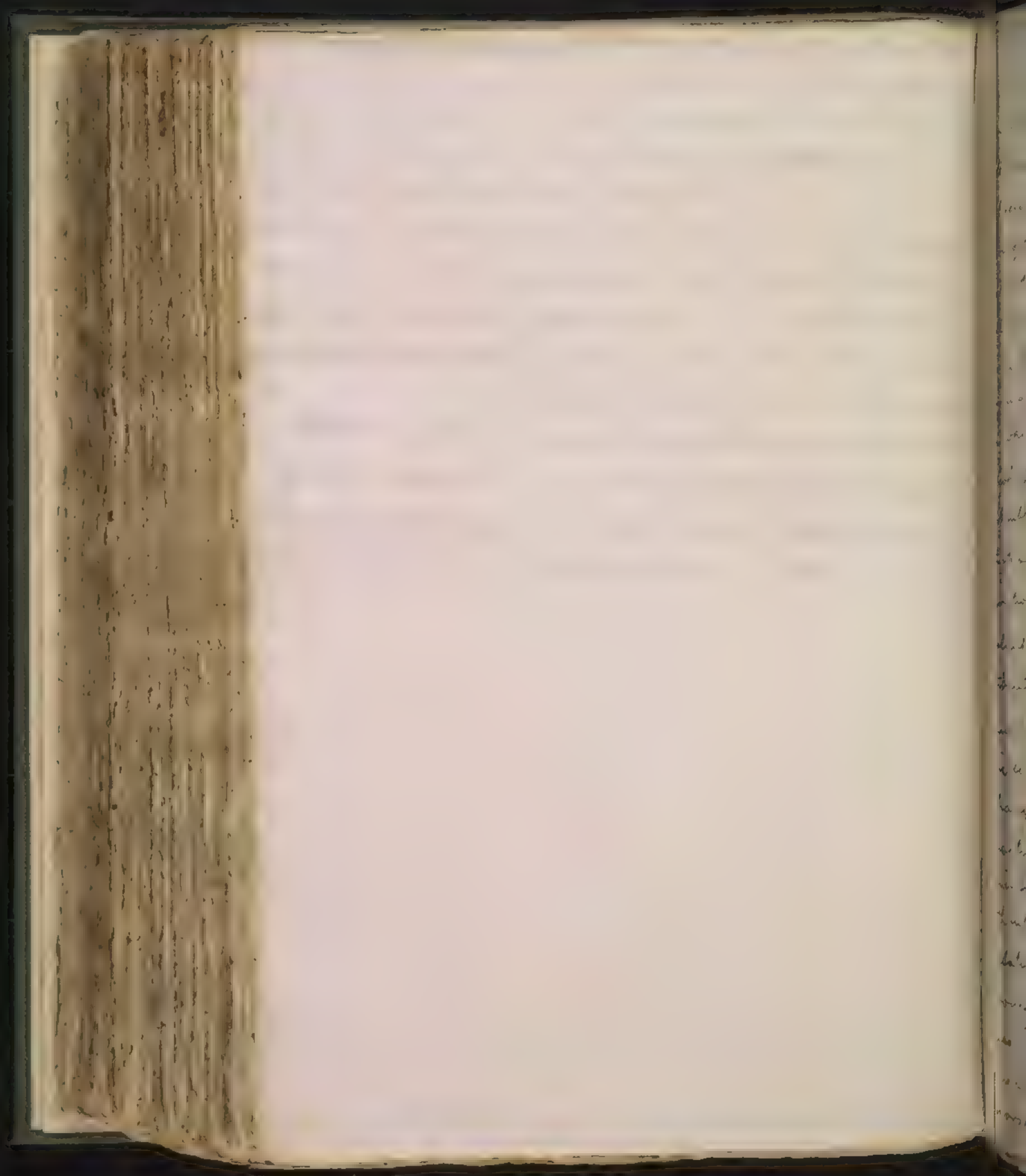
separated by the expansion of warm water.

Metals will not unite with earthy bodies in their metallic state nor even with their own oxides. Some of the oxides unite with acids or alkalis. Metals never unite with each other for inflammations. They all unite with fire but some more homogeneously than others. Hence one metal cannot be separated from another. Iron should not unite with sulphur until with heat in sulphuric. The color of inflammations metallic is black. Δ from inflammations and are reduced to their metallic state. ∇ aromatic and ^{unburnt} oils and essences and employ for this purpose. This process is called reduction. The metals after reduction regain their usual weight. Thus the 12th of lead mentioned before after reduction will weigh only 100th sometimes not so much. Hence a loss of a small portion of the metal in calcination. There is a propensity of communicating to metals a larger proportion of the power of inflammability than is natural to them. Most metals readily unite with each other this is the foundation of a variety of useful arts. Most of the metals may be dissolved in water when united with an acid. A few of the metals only are dissolved in water by the intervention of fixed air and some even without this. Air acts upon some metals rusting them this is owing to a gradual operation of the Δ ~~fire~~ without the application of heat. Chemists should therefore rather call this calcination. This affords another argument against metals.



als containing fixed air. All substances which contain fixed
air attract it instead of parting with it when exposed to the air.
From these metals are found in the bowels of the Earth. The
knowledge of them was not general till most of the other
are ascertained and but the properties of them do not seem
rapidly investigated within these few centuries that
it is hard to say whether nature and art has made the
greatest progress in the Earth. The metals are seldom
found pure but mostly combined with other bodies and
then called ores. They are most frequently combined with
either the other metals arsenic and sulphur. Sulphur
has been already treated of but arsenic which is itself
a metal shall be treated of immediately before
we enter on the consideration of particular metals.

Of Arsenic.



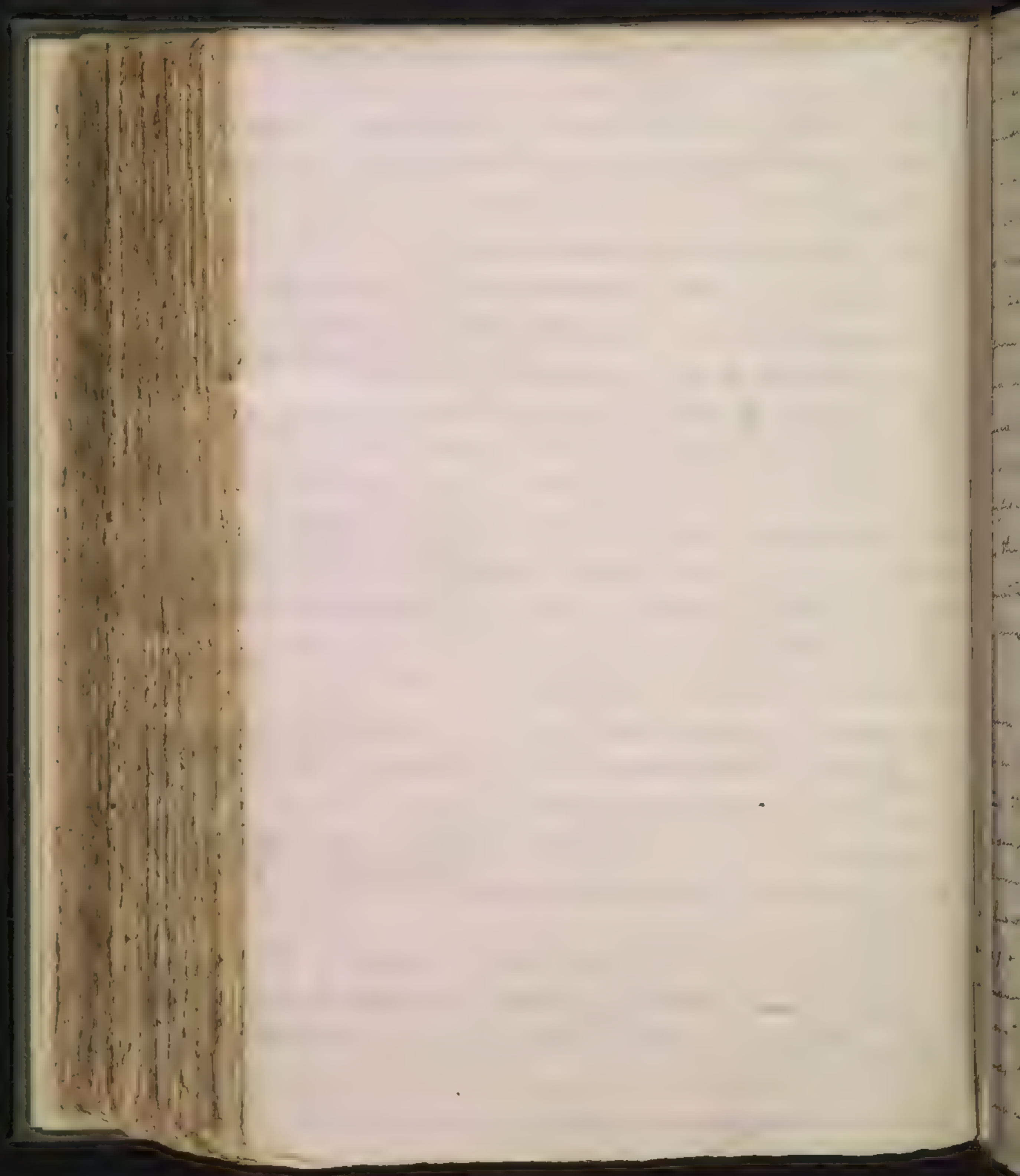
Of Arsenic

... small pieces low than the transparency when exposed to the
... It resembles salt but differs from it in containing some
portion of the Δ . It has been ranked among the metals by
some but it belongs to none of these classes. It acquires
in all the mineral acids with a strong effervescence. It ap-
pears in the fixed alkalies more readily without effervescence
than in a red heat but in a moderate heat gives
off a smell like garlic then fumes may be condensed
and which is a certain mark of our containing arsenic
and it sublimes into crystals. It decomposes nitre uniting
with its alkaline basis. It throws out fumes but no de-
flagration takes place. The arsenic unites with the
alkaline bases and forms a salt which may be con-
verted into crystals and which do not attract the
moisture of the air. Every other salt formed with oxy-
gen becomes moist on exposure to air. It produces
no change on iron nor salt owing to the slender
attraction which the mineral acid has for the Δ .
Arsenic has more affinity to the earths when combined
with sulphur it dissolves in lime water. This is the
foundation of a syphilathetic cure. Combined with lead
it proves the strongest flux to the most refractory
bodies. It has a strong attraction to the Δ and
forms with it a metallic arsenide. ...
oxyarsenic is entirely composed of Δ and an
acid



and it resembles molecules of antimony fused with
pulver of arsenic. It adheres itself to sulphur with
which it forms callosa and it is then called malgum
or Opiment. Its poisonous qualities are much di-
minished by this union with sulphur. It acts upon
metals with all the metals in various ways, for
example, and renders them brittle hard and white Lewis
found that it would unite with Gold and Platinum
metals with which it was formerly thought impossi-
ble to unite it with. It has a strong attraction to and
turns Copper white hardening it and forming with it
what is called white metal. This white metal should
not be used to make vessels for culinary purposes
both Copper and arsenic being extremely harmful to
the human Constitution. There are 3 Methods of
discovering the presence of arsenic 1st by throwing
the substance supposed to contain arsenic upon burning
coals if there is arsenic contained in it a smell resembling
that of garlic will be perceived. 2nd by placing the
substance between two Copper plates wiring and heating
them together and throwing them into the fire, if the Cop-
per becomes white where it is in contact with this substance it
is a mark of the presence of arsenic.

3rd Upon pouring a solution of the substance supposed to
contain arsenic into a solution of vegetable fixed alkali, to a
solution of Blue vitriol the mixture becomes green (accord-
ing to Bergmann) it is a certain sign of the presence of arsenic
Arsenic is used to promote the fusion of metals and so



a. i. diss. It dissolves in 15 times its weight of warm water and
30 times its weight of cold. The solution of arsenic in water is
the foundation of a preparation of it mentioned as a febrif-
uge in intermittent fevers by Boerh. in the Chinese Medecine.
It is a violent corrosive poison to the human species and
indeed to most if not to all other animals.

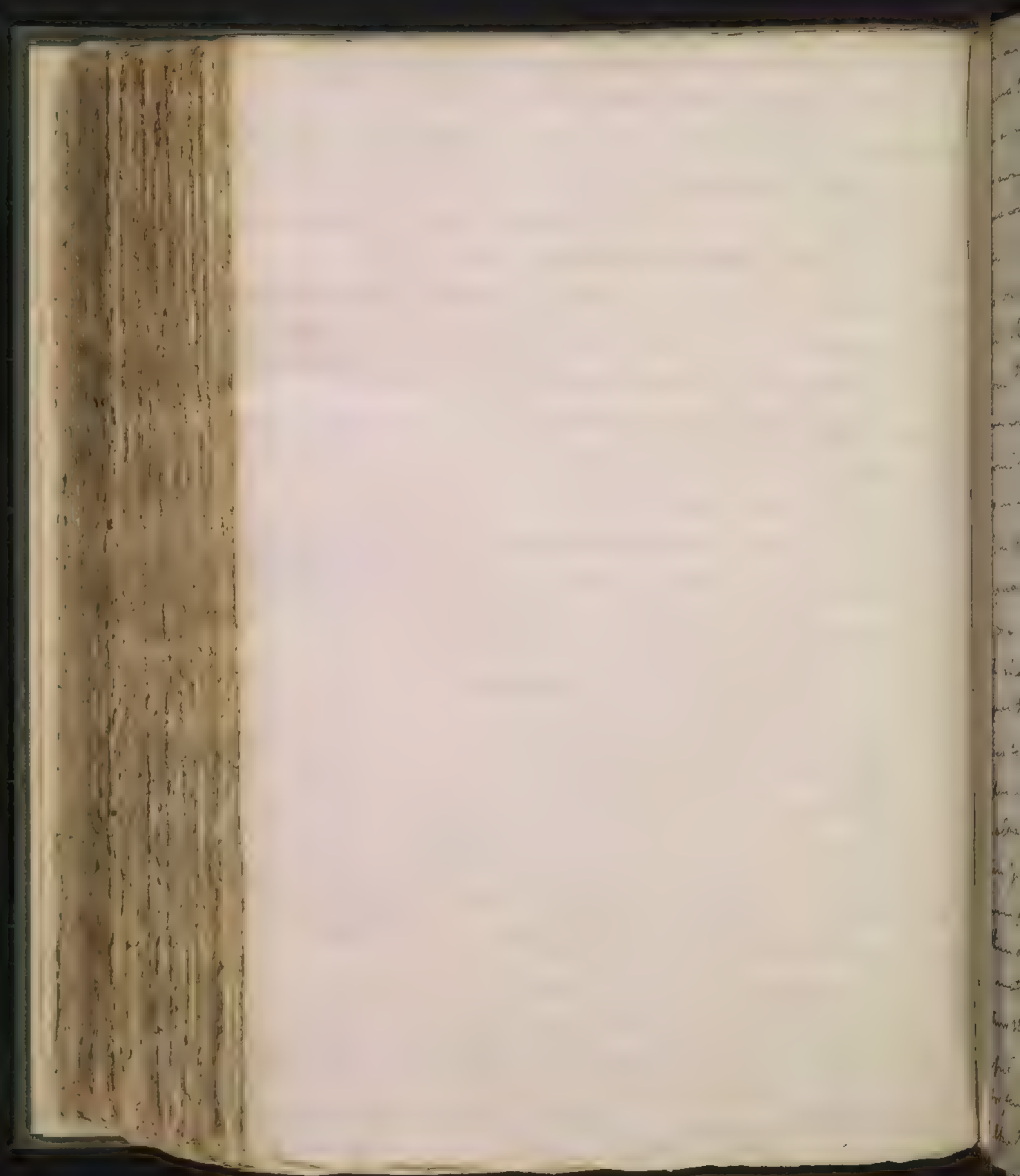
When arsenic is never found pure in the white crystals
liged form we find it in the shape it is combined with bor-
ax and metallic matters. It is got in Germany from an
ore called Mispickel from which it is raised by being
burned in oil. The second sublimation hot ash is added
whereby it in some vessels in the receiver it melts and re-
ceives the form in which we see it. As it is very volatile
it separated from metallic substances by simple sublima-
tion a large vessel is placed over to receive it.

Of Locomotion

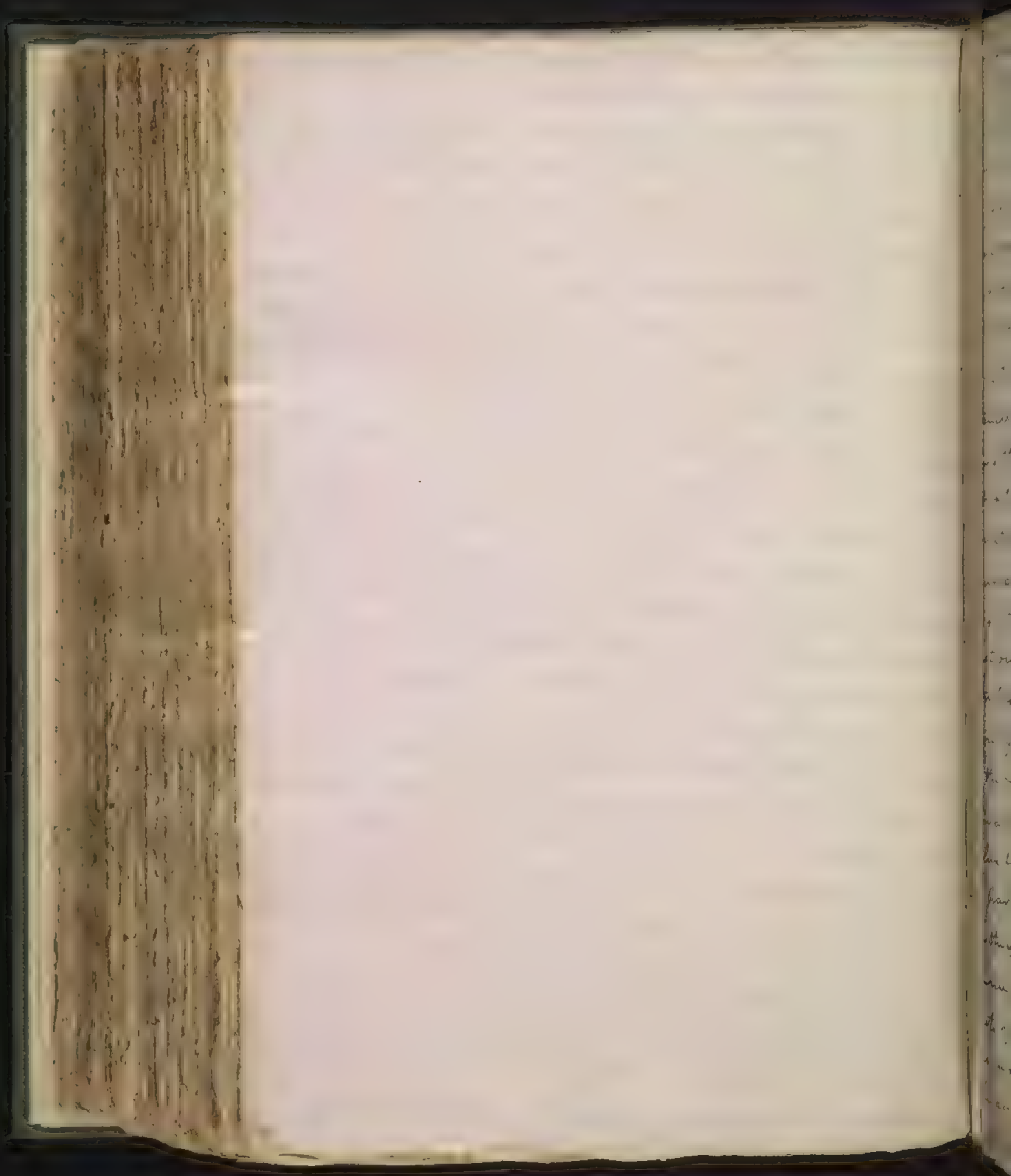
The Art of separating Metals

Locomotion is the art of separating metals from each other so as to
know the quantity of each contained in an ore and the pro-
portion to be removed from working them. This definition is taken
from a famous German Book that contains
all the knowledge we possess on this subject. The word spray is
derived from the French word *Éprouer*. In Germany this art is
independent of mining and is carried on by separate persons.
The operation of metals from their ores is effected in three
methods. 1st By mechanical force 2nd By heat and 3rd By
acid and mixture. The first method is used when sorting

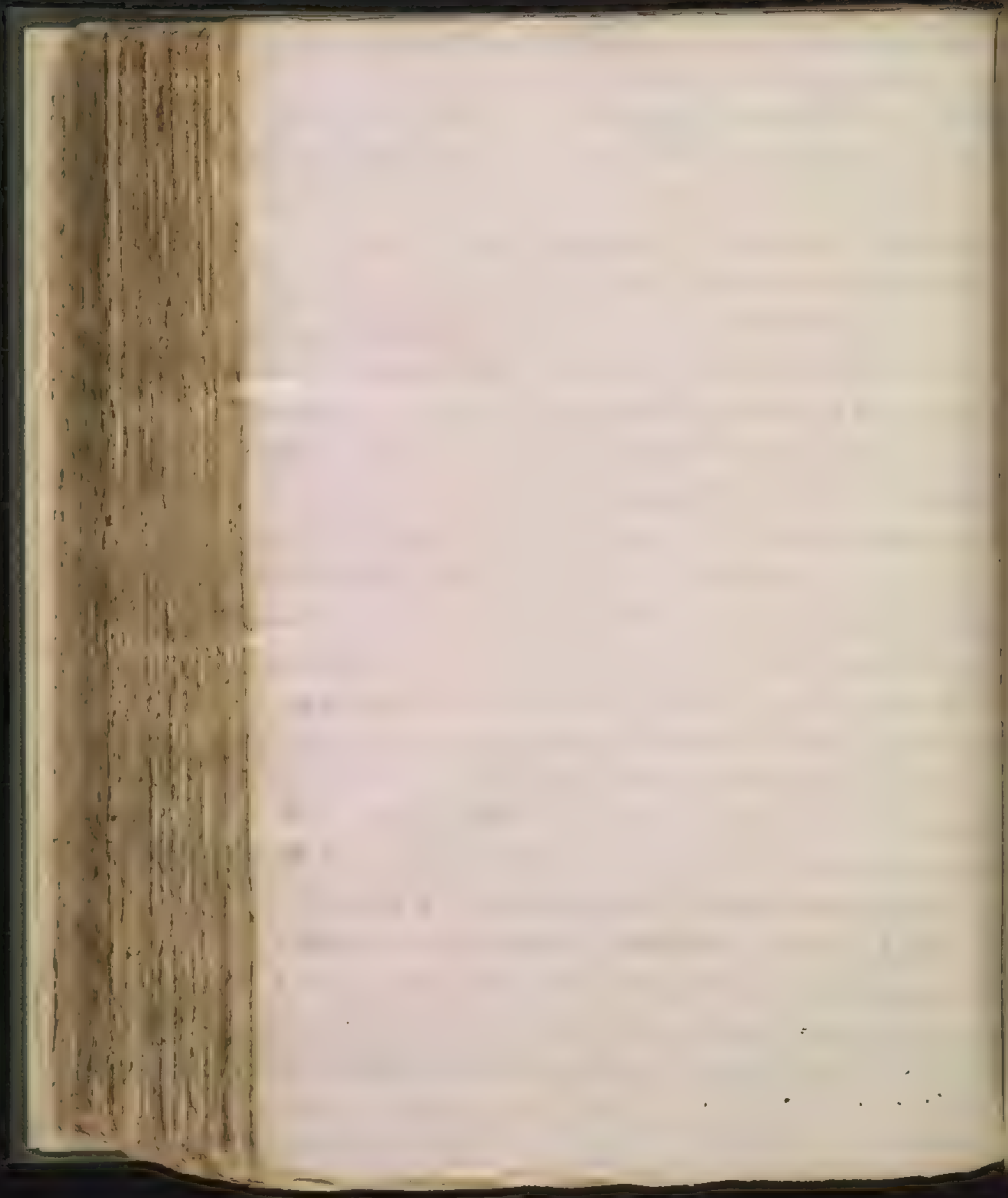
Motters



Matters are combined with the metals. These earthly matters
are called the Matrix of the metal. The whole mass is pour-
ed in a mortar and then exposed to a stream of water which
washes away the Earth and leaves the metal behind: it will
melt with the Matrix is not closely combined with the
metal. The Manner will this process was, using the 2nd
is used when sulphur and arsenic are combined with the
metal (this is called roasting) The heat should be gentle
otherwise these substances will carry round portion of the Me-
tal over with them. The 3rd is used when it is necessary to
add round other body. All the acids act on the ores. They are
not so much used to extract or to find out what they con-
tain. The Nature of the metal may be known first by the un-
der qualities or the color and taste thus if an acid is
added to a copper ore it will have a greenish color. An acid
which should be the vegetable added to an ore of lead
will give the ore a sweetish taste 2nd Precipitation is
also used to know what metal an ore contains. Thus an
ore may be extracted the metal after being dissolved in an acid
by an alkali. By adding aq. Regia to an ore supposed to
contain gold and then adding an alkali if pure gold is present
on orange fulminans will be precipitated. Alkalis and mon-
and than acids, then promote the fusion of the Earthy and Me-
talic matters, but are inconvenient, as if the ores contain
Sulphur they will form Hepos Sulphuris which is of a
powerful solvent for the Metals. The metallic salts are much
used for fluxes, but they are liable to the same objections as
alkalies their acid being generally dissipated. Borax



1901. and Sol microcosmus or the salt of wine and except
them to the general rule, but they are too expensive. Sandrus
or Sol vitriis superius or a flux to these neutral salts. This
instance is drawn from the use of roasted glass. It is com-
posed of equal alkali, of common salt which is generous, is mixed
with and of a small quantity of glass. See these instances, and
add sales fusors. Of the Earthy quick lime is most used
and is liable to the same objections as the Alkalies. Hence
it is not subject to these objections. Of the Inflammable
Substances charcoal is most used to separate metals from
this ore this imparts its ϕ to the metals and thus prevents
oxidation. Charcoal is of great consequence to prevent
calumination; hence it is necessary to keep out the air for
this purpose we throw in common salt or glass which
float on the surface and thus defend the metals from
the action of the air. For this purpose we add what is cal-
led the Black flux. This is composed of 2 parts of tartar
and one of nitre. The nitre is decomposed and united
with the principle of inflammation of the tartar they must be de-
flagrated before they are used. The Black flux is the
best flux for ores. The alkali fuses the Earthy and the
saline parts and unites with the sulphur or arsenic
while the ϕ unites with the metal and prevents
calumination. This differs from the white flux which
consists of equal parts of tartar and nitre. The nitre
in this case is entirely decomposed and the ϕ gas is
expelled. The acid is thrown off by the inflammation in pro-
cessing



pouring it and nothing but a hard alkali remains. When in
the Black flux the fusion should be made as quick as
possible that the Fe may not fly off. But as this Black
flux is too expensive we make use of one of Scoria
composed of glass and a small quantity of metallic
matter. The Scoria acts as yeast to know when the fusion
is complete and attend to the following circumstances
We find a film between the metal and Scoria the
heat is too great and when particles of metal is found
in the Scoria the heat has not been sufficient. Metals
we sometimes used to separate Sulphur and arsenic
from each other thus iron is used to separate sulphur
from Mercury. If we want to separate sulphur from
mercury roasting will not do as the mercury would
be volatilized with the sulphur. Alkaline salt will
not as they form a Hepos. salt. which dissolves the
mercury; we find that iron attracts sulphur stron-
ger than mercury does and therefore put iron
bars into the retort along with the sulphur and
mercury; the mercury rises pure into the receiver
and Metal is sometimes added to the ore of another to se-
parate foreign matters, for this purpose Lead is added
to the ore of Silver. The lead melts and carries along with
it into the pores of the ore all the foreign matters
that were mixed with the Silver. This Metal is some-
times added to another to separate it from its ore, thus
mercury is added to the ore of Gold, it unites with the
Gold



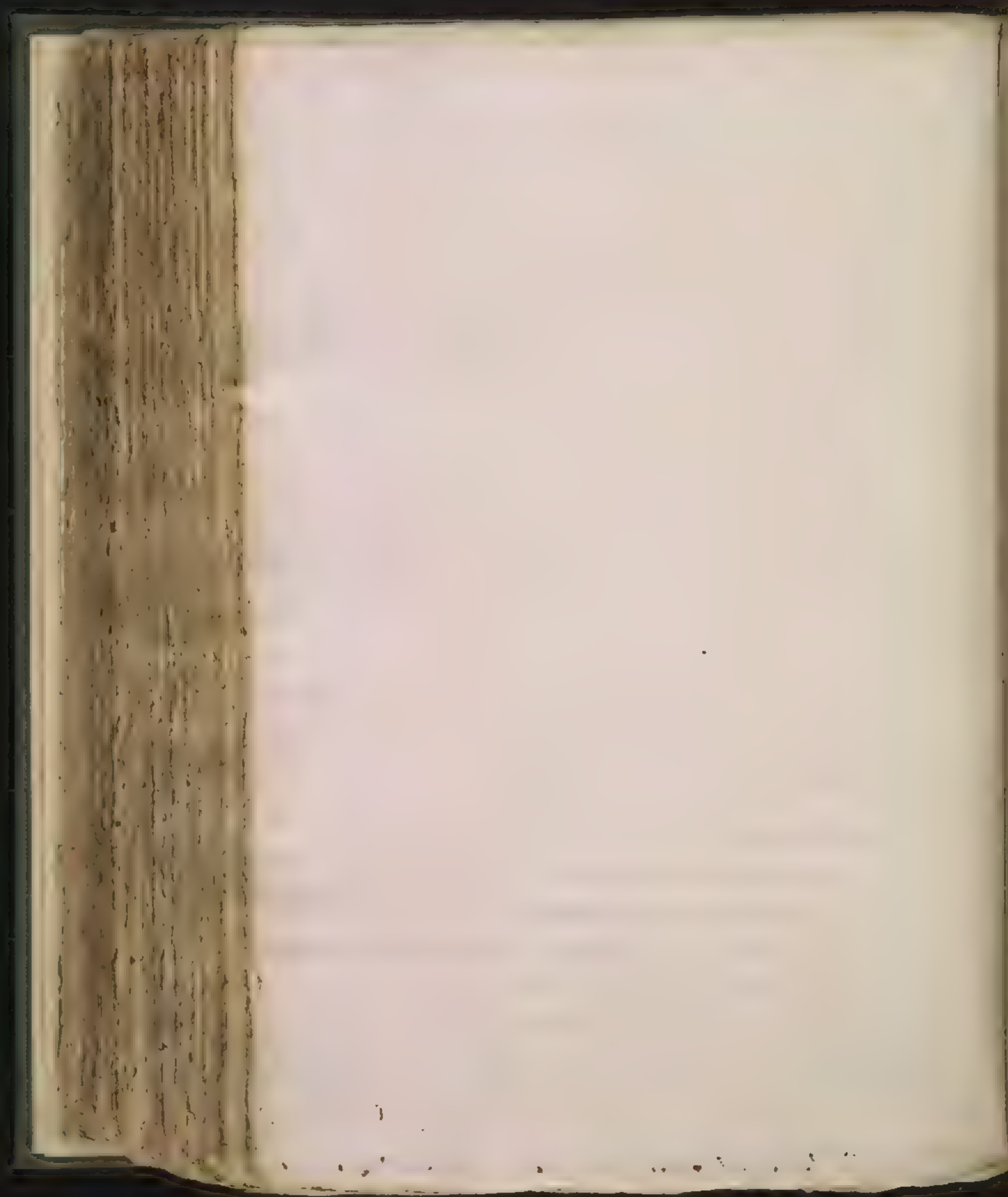
joint with which it forms an amalgam. The mercury is afterwards separated by sublimation or selective attraction. Iron is combined with other metals by various means which depend on the different nature of the metals. We shall have an opportunity of seeing this soon in our experiments. Water is used to separate ores from their Matrix. If it acts chemically on the matrix, as in the case of lead, the water thrown on it will rotten the earthy matters of the matrix, the silicious earth especially, making it brittle with its acidity. This is the only way in which water acts chemically. With this we finish our account of the decomposition would not have you suppose that all metals require these operations to separate them from and to reduce them to a pure uncombined state. These require to be treated differently from what we have mentioned.

Properties of the Metals

The Perfect are those Metals which are ductile, is the action of fire and are the Semi Metals and not possessed of Malleability and ductility.

The Perfect cannot be changed by the action of fire or air. The Metals usually described by chemists are divided into Perfect and imperfect. The imperfect are further divided into semi metals and imperfect metals. The semi metals are Mercury Antimony Zinc Bismuth Cobalt Nickel Lead with Molybdenum and Wolfram. The imperfect Metals are Lead tin Copper and iron. The Perfect are Gold Silver and Platinum. The Number of the whole is 16.

Mercury



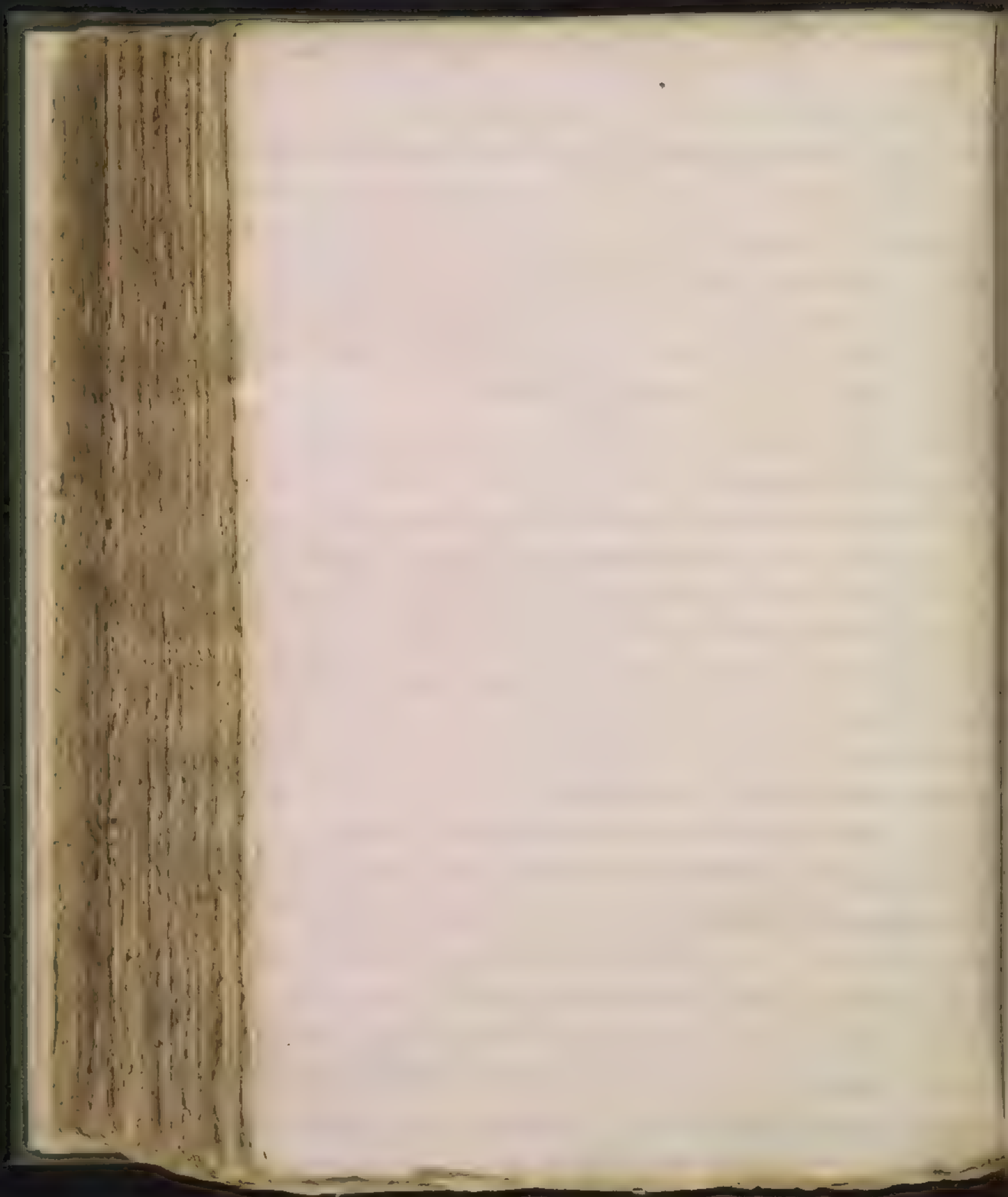
Mercury,

Were I to enumerate all the facts concerning Mercury to be found in Books, I should swell these lectures beyond the Bounds prescribed to us. There is no metallic substance which has been more worked upon than this, partly from the great relation which it bears to the other objects of Chemistry and partly from its being supposed to contain the seeds of Gold, since it attracted the attention of the Alchemists to whom we owe our indebtedness for most of the preparations of it add to this its great usefulness in curing the venereal disease, which from the wrong management of Physicians was looked upon as incurable until mercury was found to be its antidote. This led the Chemists to make various experiments for finding out the preparations which would be the safest and most effectual in producing a cure and to these we owe indebted for the most valuable Information. I am confident that I differ from others in calling Mercury a true metal since it has been fixed by Mr Bracon and Mr Bracon fixed it could have considered it as a perfect metal, but we should consider bodies in the same in which are most usually found and distinguish them as they are presented by nature. Thus in treating of the history of Water we consider as a fluid, its conversion into ice by cold does not invalidate our proposition as fluidity is undoubtedly its natural state. Therefore we consider mercury as a semi metal. The most obvious properties of mercury are 1st Its great weight in which it exceeds all metals except Gold & Platinum. 2nd Its great fusibility and want of ductility and



3rd Its great Volatility by which it is converted into vapor by
a very moderate heat. It is the heaviest of all metals except
gold and Platinum and is to water as 14 to 1

Mercury is much changed by simple Trituration especially when
any solid substances are added which divide its parts mechani-
cally. Eg. When laves of Gum arabic Sugar honey or rosin are
Mercury is changed by elongation without mixture. It is pre-
pared by mangle honey &c when intended for internal use
Balsams particularly by Turpentine and much used to divide
when it is to be applied externally. All these instances act
mechanically and no chemical reaction takes place.
By heat it boils and evaporates but no decomposition takes
place if the vapors are condensed they are found to be pure
Mercury. This is a method of purifying from volatile
Matters particularly exposed for some time to heat
below the boiling point of the part with it. It is re-
duced to a ball and converted into a sparkling red powder
and is therefore very ^{im}properly called mercurius ruber
as it is. It should be called Colic of mercury or red pre-
cipitation takes place. Mercury dissolves readily and intima-
tely in the vitriolic acid when it is assisted by heat in the
cold it coagulates and the result of this combination is a
white salt which dissolves in warm water leaving a
yellow powder which is called Turpeth Mineral. The water
dissolves that part of the compound which has most
saline matter in it. The London Dispensatory orders us
to wash the Turpeth mineral in water untill it comes off
perfectly unspiced, but Dr. Lewis forbids washing it so
he



In case all the acid will be worn away and nothing but a saline
mineral is left of this is from 2 to 3 grains an alkali will precipitate
the mercury from the water in form of a salt. The nitrous acid
will more strongly on it and forms a white powder and imparts
only 1/4 grain will dissolve an equal quantity. When this is mixed
it according to the London dispensatory in acid of salt & blue
color from the same in 1/2 of the mercury. Some say it is drops
produced by the union of the nitrous acid and mercury
in mercury are the proportions for the preparation of Woods
drops. 10 1/2 of highly concentrated nitrous acid add 7 1/2 of the
acid an ounce after the experiment has ceased add 4 1/2 of
mercury digest them in a gentle heat till all the mercury
is dissolved. Put it in a cool place and some tellie salt will
crystallize to each 16 1/2 of this salt add 1/2 of Rose water
let them stand till the salt is dissolved which will generate
in 24 hours Two Drops of this and take ^{one} ^{every}
4 hours each drop does not contain quite half a grain
of mercury. Mercury may be separated from the nitrous
acid either by heat or by mixture. Heat separates the
water and leaves the Nitric acid and Mercury which it finds of use
in the form of a yellow greyish powder which is a highly
acid salt of mercury if the heat is a little urged it turns
to red color and is then called red Precipitate or red
corrosive mercury. This is improperly called precipitate or
nothing substance is added. In the London dispensatory
we are ordered to add the Phlegmatic acid which makes it
longer and gives it a deep red color and a more sparkling
appearance. It is more acid than when prepared from
the

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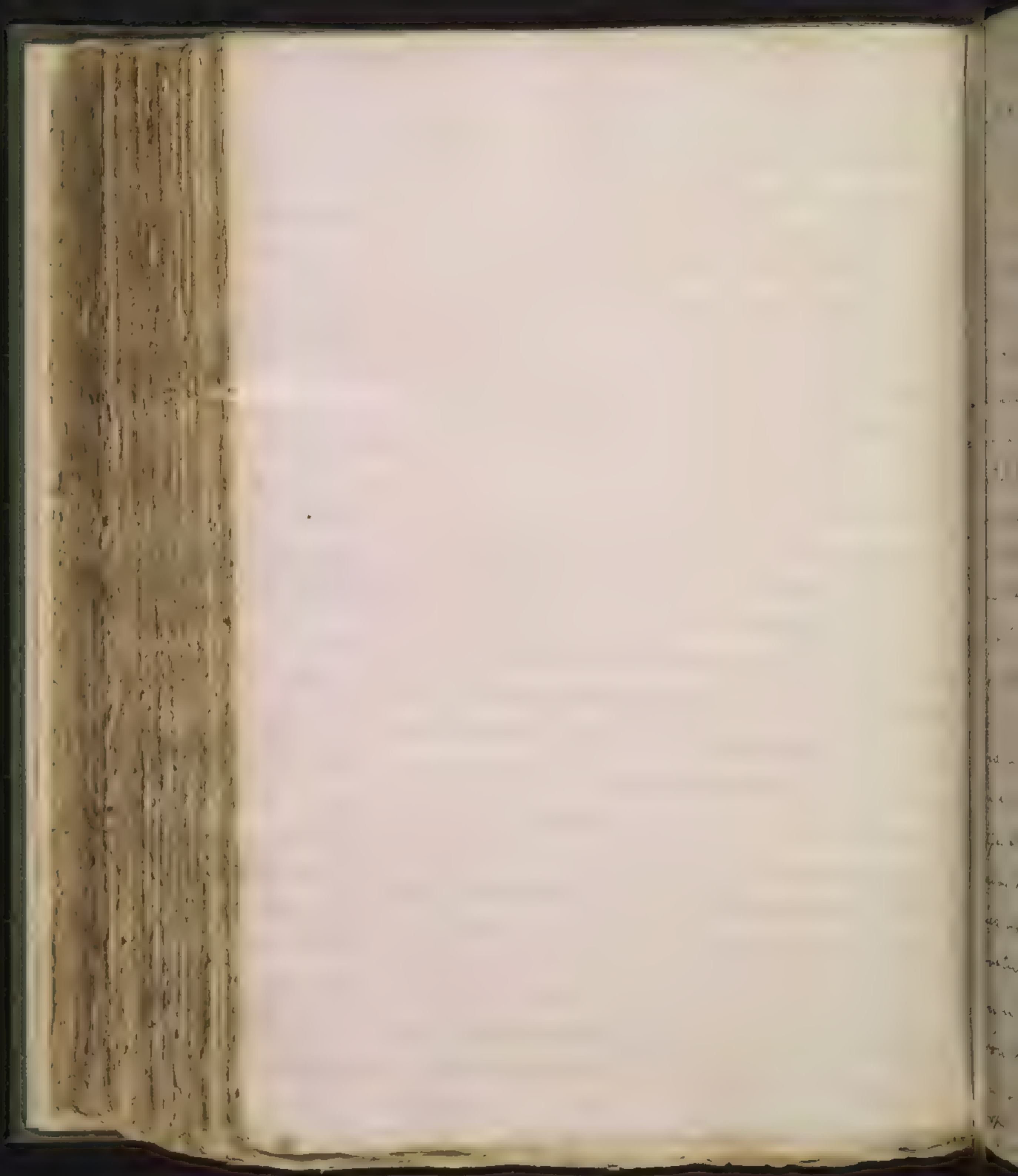
in minor and acid owes to the strong attraction which the
mercuric acid has for the oxygen in the salt of a base in the
mercuric acid solution of the common sulphuric acid. The
mercuric acid is a powerful oxidizing agent and spots
of it is one of the commonest means of staining the
mercuric acid is a powerful oxidizing agent in the mercuric acid
and shares, with water, the property of being a powerful
oxidizing agent, as in solution of a white, or even a weak
solution, in difference in the degree used as a reagent in
to determine the presence of, or to detect a solution of the
mercuric acid in solution and in solution in solution
with metallic state and when in the form of a salt will
separate it from the other metals and acids, and add common
salt to a solution of mercuric acid in water, a decolor
solution of mercuric acid in water, and the mercuric acid will be
precipitated from the mercuric acid solution to the mercuric
acid it cannot be separated by heating it in the mercuric
acid in the form of water, and the common mercuric
mercuric acid is, one method of separating the mercuric acid
from mercury by means of a solution of mercuric acid in
a solution of mercuric acid added to a solution of mercuric acid in
water a substance is precipitated as a green color which is
mercuric acid in water, and the mercuric acid is understood
and the nature of the compound of the mercuric acid
and mercury, the mercuric acid will act
the state of a salt before the mercuric acid will act
on all the mercuric acid in solution with the mercuric
acid and made by first dissolving the mercuric acid
in the acids which not only of it, and advancing it to the
state

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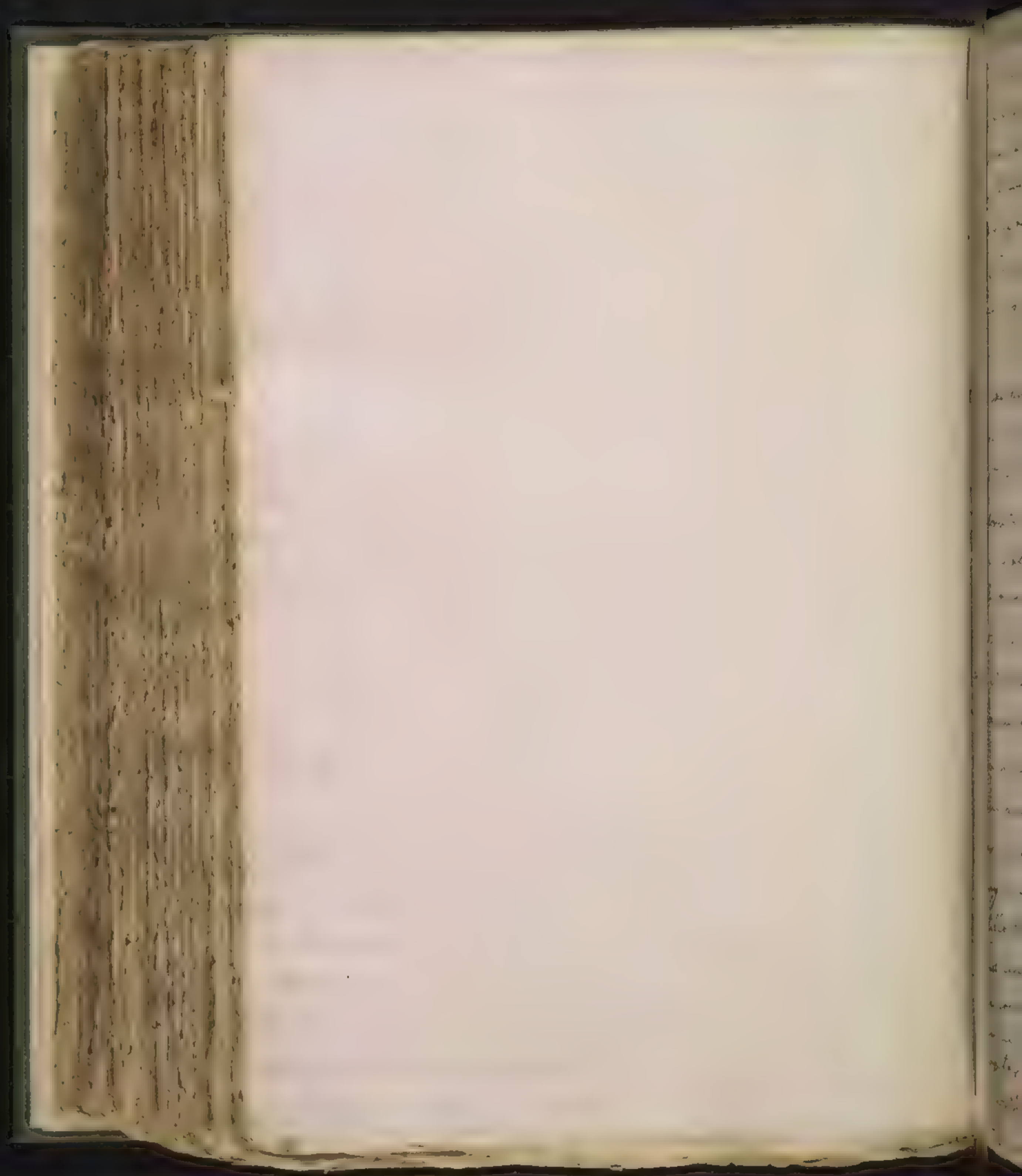
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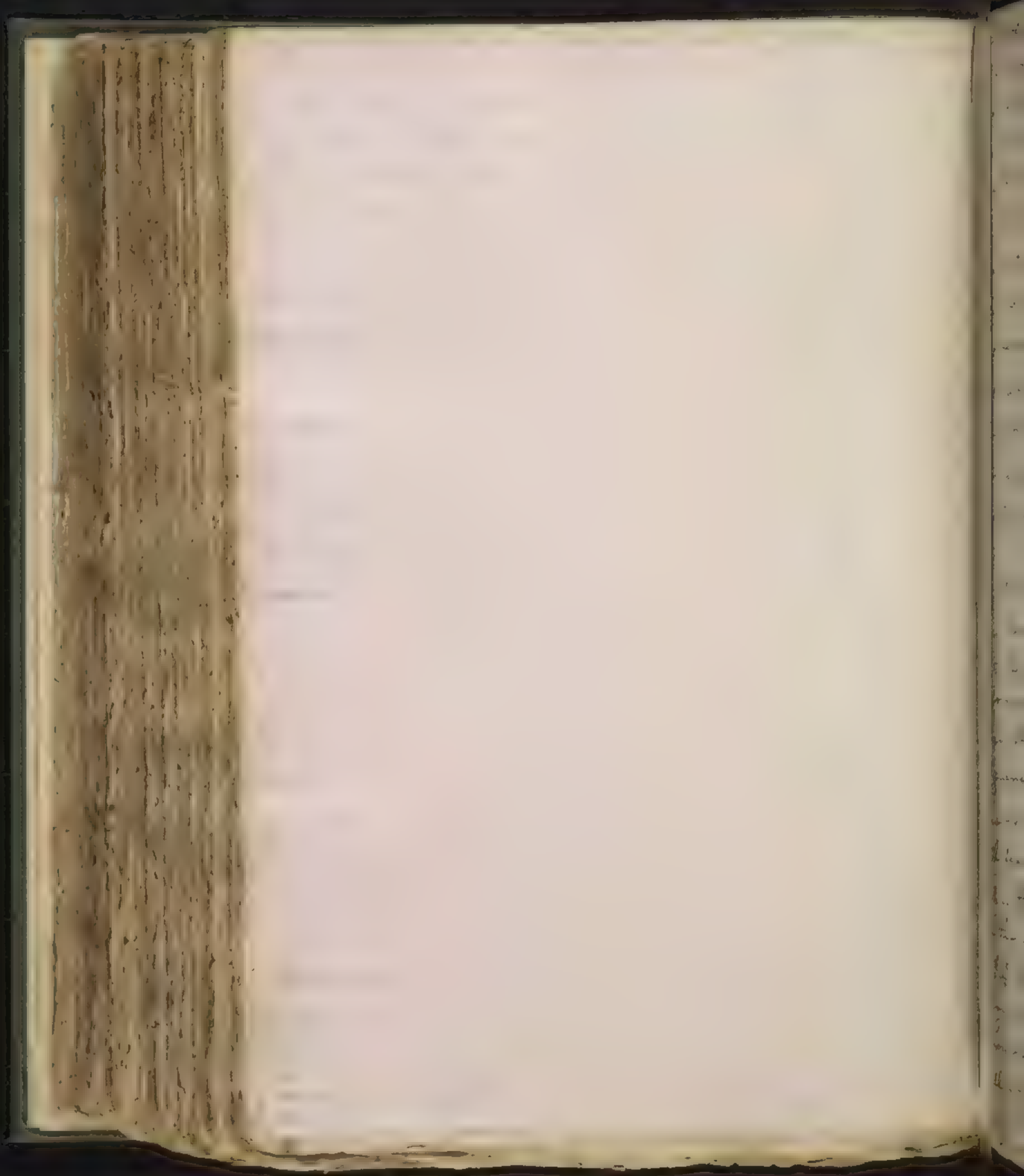
with a calx. This corrosive ultimate when saturated
with an additional quantity of pure mercury and after
distilled forms the mercurial dulcis which runs into the
mercury in the form of a steel and far harder than corrosive
mercury, and exhibits no action on the tongue. It is
shown more gentle in its operation than the corrosive dulcis
from the metallic salt, and more powerful in proportion
to the strength and quantity of the acids may consist in this
as the quantity of mercury is increased consequently
the metal is in a smaller proportion to the quantity of the
acid and is therefore more purified. The mercurial
dulcis of Linnæus is termed formæ calomel. This is more
delic than the mercurial dulcis as it is with more of
the principle of mercury than the other proportions
are apt to be supersaturated thus Arsenic and Rochelle
turning on often mixed with Calomel the first is dis-
tinguished by either of the three tests before mentioned the
last by the peculiar disagreeable sweetish or brimstone taste
that it gives when dissolved in Water Margousol is
thought as a method of combining mercury with the
vegetable acid the mercury first is calcined in the
nitrous acid the acid is afterwards evaporated the
vegetable acid units with the Calomel evaporation
combination forms a sublimate like that formed
with the mercuric acid The famous Keyers Pills are
formed by uniting mercury with the vegetable acid. The
acid which when brewed with bees wood was made
to unite with mercury it is first calcined in the nitrous
acid but this combination has never been used in
medicine.



... does to ... an ... substance
... water ... and do not
... with ...
... of the ... will
... and, ...
... for ...
... has a great attraction ... it ...
... it is ... for this reason by the old ...
... it ... after all the change
... has undergone by heat and ...
... to its metallic state ...
... with ...
... with ...
... the production of this
... are mixed together all day and ...
... with ...
... this one
... another
... is
... this they are
... and ...
... receive a red color
... with that
... the method
... when we come to
... all the metals
... and for arsenic
... other metals
... readily



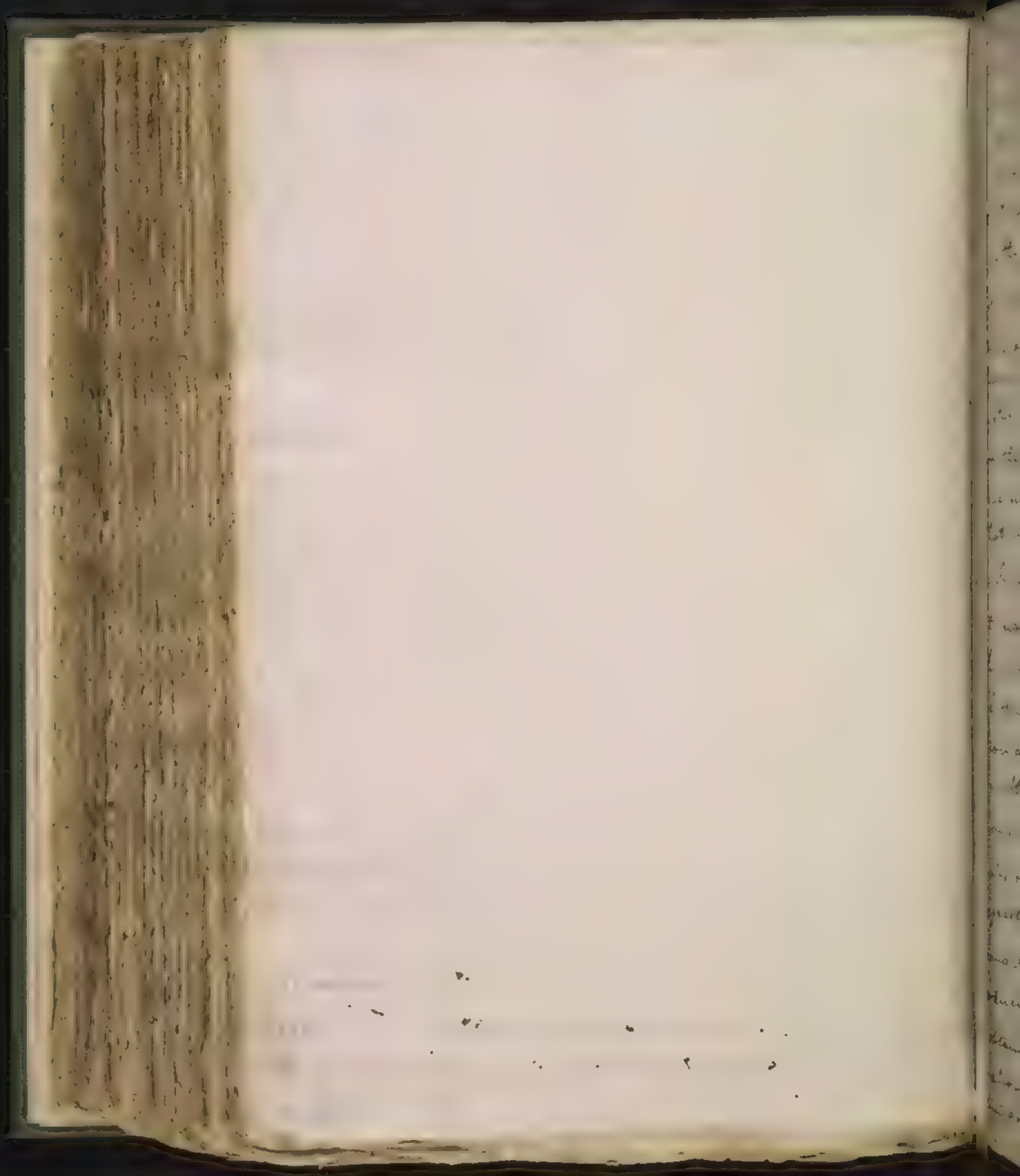
readily with those that fuse easiest. The mixture of mercury
with other metals without heat is called amalgamation. These
are of different consistence according to the different
metals contained in them. The hardest metals are softened by
it will even form an amalgam with gold, thus when
a silver ring has become fixed on the finger of persons who
have grown suddenly hot or not to be easily removed
by rubbing mercury on the ring it will move on it it will
be brittle or to be easily broken off in case then it
is struck with a key, a person who is in the use
of mercury should be very careful not to wear
gold buttons or watch on the fumes of the mercury
penetrating the pores of the skin much affect them.
Mercury also enters dead on this depend, the practice
of military Surgeons the pour mercury into a wound
in which there is a harden ball which in time is
soften it that it may readily be taken out. In by means
of an amalgam with tin that use gold mirrors. The tin is
beat in small plates upon the glass the mercury is pour
on them and water with them. The glob is so closed that
the Mercury that will not unite with the tin runs off
the mercury may be easily separated from all amalgams
by distillation as it is volatile it flies over into the receiver
and leaves the metal behind. Mercury cannot be
made soluble in water in its simple state hence the
worn medicine made by boiling pure mercury
with water has no effect. But if the mercury is first
mixed with sugar or gum arabic till it is combined
and



and its Globules disappear it may be dissolved in water in a small proportion. Of this mercury ever moves worms (as I have been assured it has) it must be owing to a small quantity of some mixed with it and decomposed in water. It is, however, long stammered in water in many cases and sometimes not at all. Mr. Goussier & Dr. Biny succeeded in this attempt. He fixed it with a silver rod below nothing. It is not like wine but contains in Alcohol or Thiers is solvent by the elements but all these attempts to obtain it have been vain hitherto as they have been after the Philosophers Stone and probably will be so. Churchill in his usual manner expresses if this will dissolve every thing in Nature which is fixed will thus lead to some

found! Mercury is found in Spain Hungary and this is
 in great quantity it is commonly obtained from
 India. Large quantities of it are commonly obtained from
 Spain in Mexico to extract the gold from it. It is some
 times found in such a state that it only requires to be
 ground thro' leather to separate it from the earth, but
 most generally it is combined with sulphur in its live
 mineral form which it may be obtained by distilling
 it with fixed alkali lime or iron filings the best
 which is the best, as they not only will not combine
 with the S but also return the sulphur and
 impart S to S . The iron filings should be ground.
 Mercury is found in this state the purest and is used

For Thermometers Barometers and other nice machine
it will not stick to the glass. There is another kind of Mosca



is called lean mercury. Mercury which has much life of the 4th.
should be used for medicinal purposes as it will be more easily
dissolved and absorbed in acids. Mercury is seldom or never com-
bined with any metal lead and antimony are on the same metal
with which has been found combined in the veins of the
earth. The antimony appears on the surface of the mer-
cury in the form of a pellicle when combined with
lead it may be dissolved by the most test it imparts to the
vegetable acid. This may serve as an argument against
the alchemists who asserted that this was the only origi-
nal metal and that all the others were formed of this. If
this was the case we should find it mixed with others
in some small proportion but this is so rarely the
case that we have no grounds to believe their Do-
ctrine. In all their experiments they endeavored to
imitate nature and to convert mercury into gold.
As to the uses of mercury in medicine it acts as a mi-
nimal stimulant increasing the quickness of the cir-
culation and the quantities of the secretions and ex-
cretions. It acts upon the skin bowels and kidneys
and particularly on the pancreas, but its action
is greater on the salivary glands. Its most remark-
able effects is producing the secretion of saliva and
increasing it, this was formerly thought necessary to
its producing its salutary effects but these and more are
fully obtained if given in small doses not to raise
exhaustion or if it is not then so suddenly thrown out of
the system except in those cases in which no particles
= by



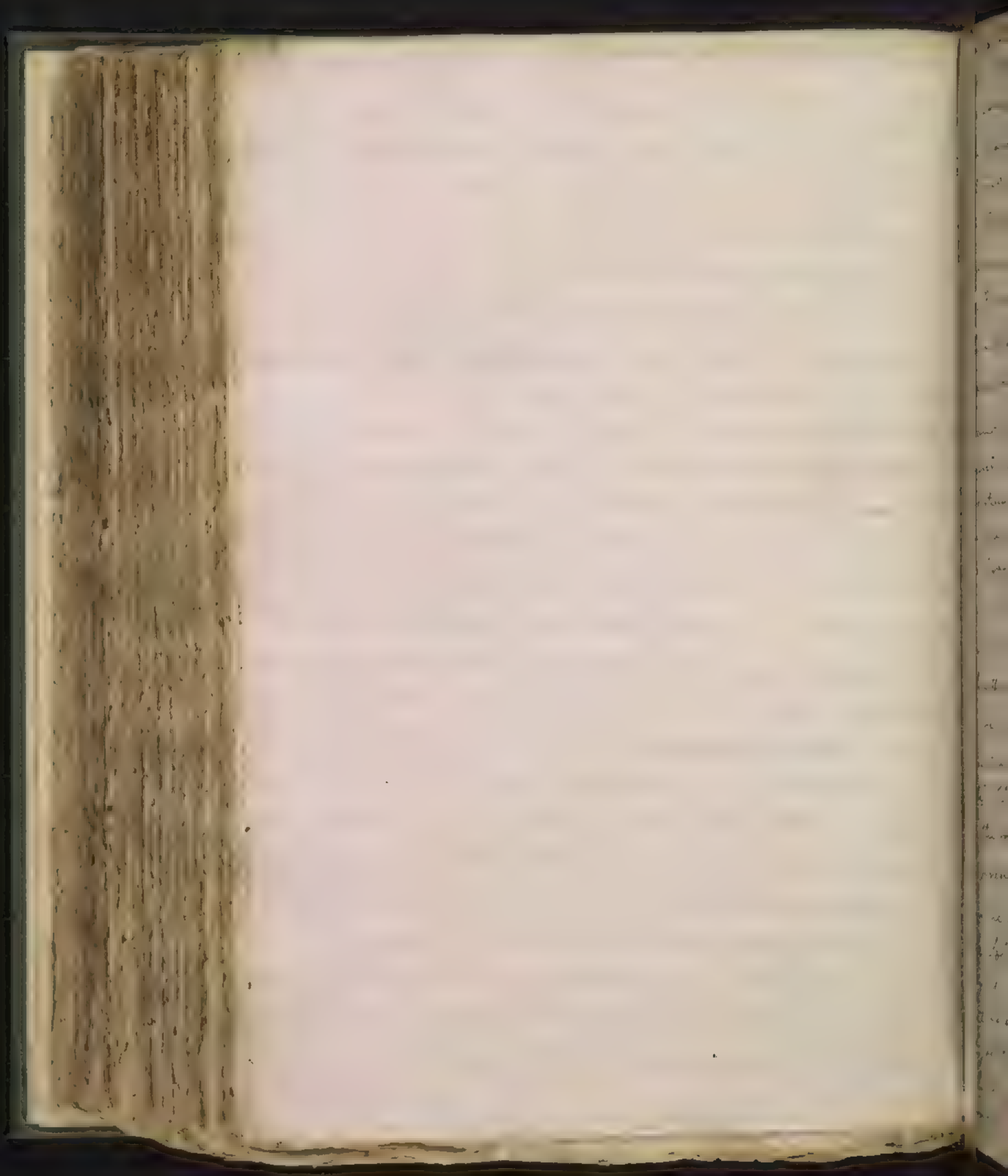
by wish to produce a salivation. It was formerly employed
out or vapor these methods are still continued by
some but internal or heliotropic are at present more gene-
rally substituted in the place of these. In the former method
the following is in its favor it is not so apt to grip and
run off by the bowels. It is therefore more particularly
proper when we wish to refrain from this evacuation.

Preparations of Mercury

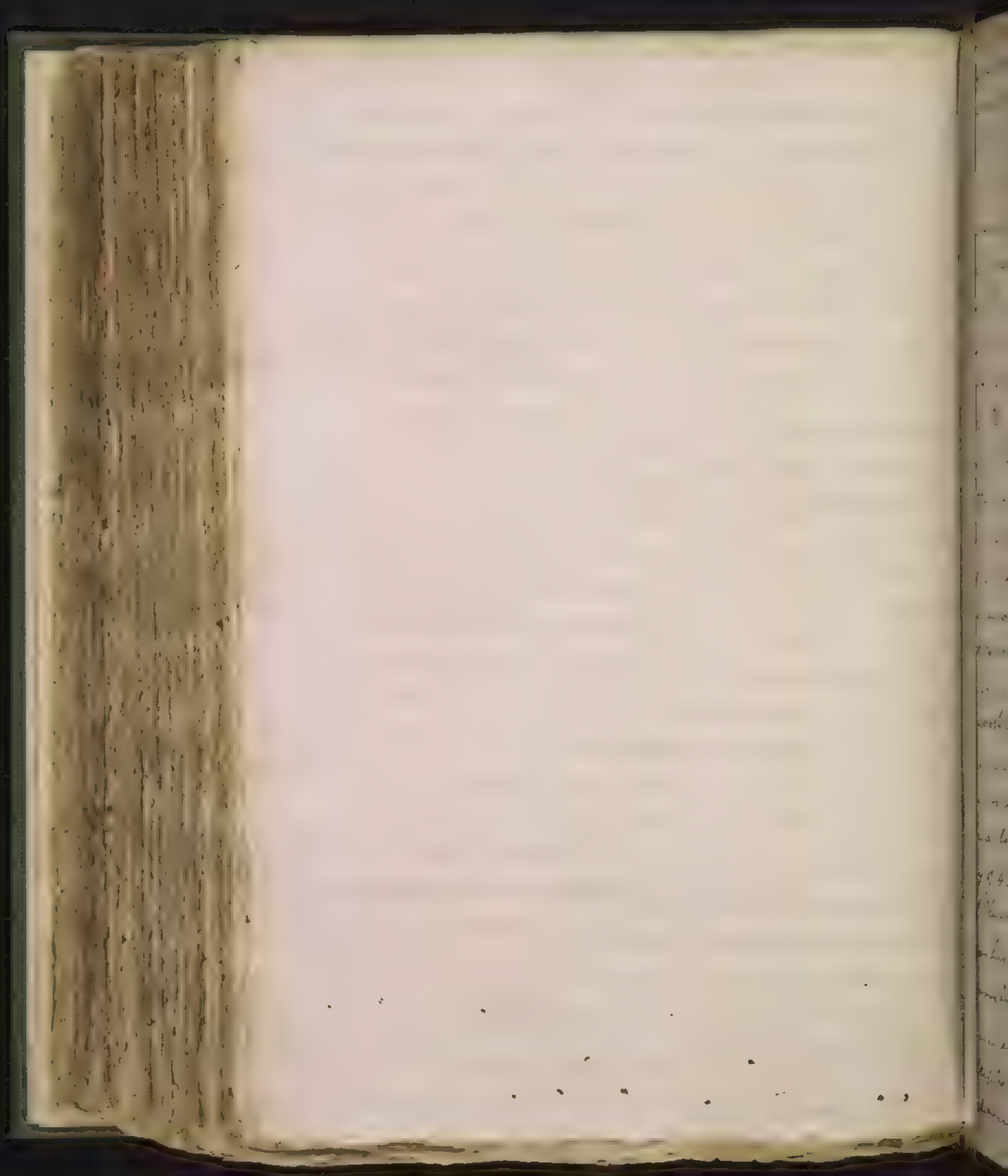
The first of these mentioned in the table are the preparations
formed by triture where the mercury is only divided.
We should always divide or triturate before we exhibit it.
The virtues of crude mercury are not accurately as-
certained. Dr Boerhaave has not determined its regu-
lar properties to employ it. When given in a crude
state it passes immediately thro the bowels. Some have
supposed it to be changed by the acid of the stomach but
as this is of a vegetable nature it will not act upon the
till calcined. When mercury appears to be retained
I would rather suppose that it is weakly impreg-
nated with the acid and that it is then acted on by
the acid in the stomach and absorbed into the system
or that it was so divided by the bile mucus and
other liquors of the stomach and intestines that
when discharged it could not be perceived.

The first operation on mercury is its purification
this is done by distilling it with worn filings which
prevent calcination or the formation of a disty-

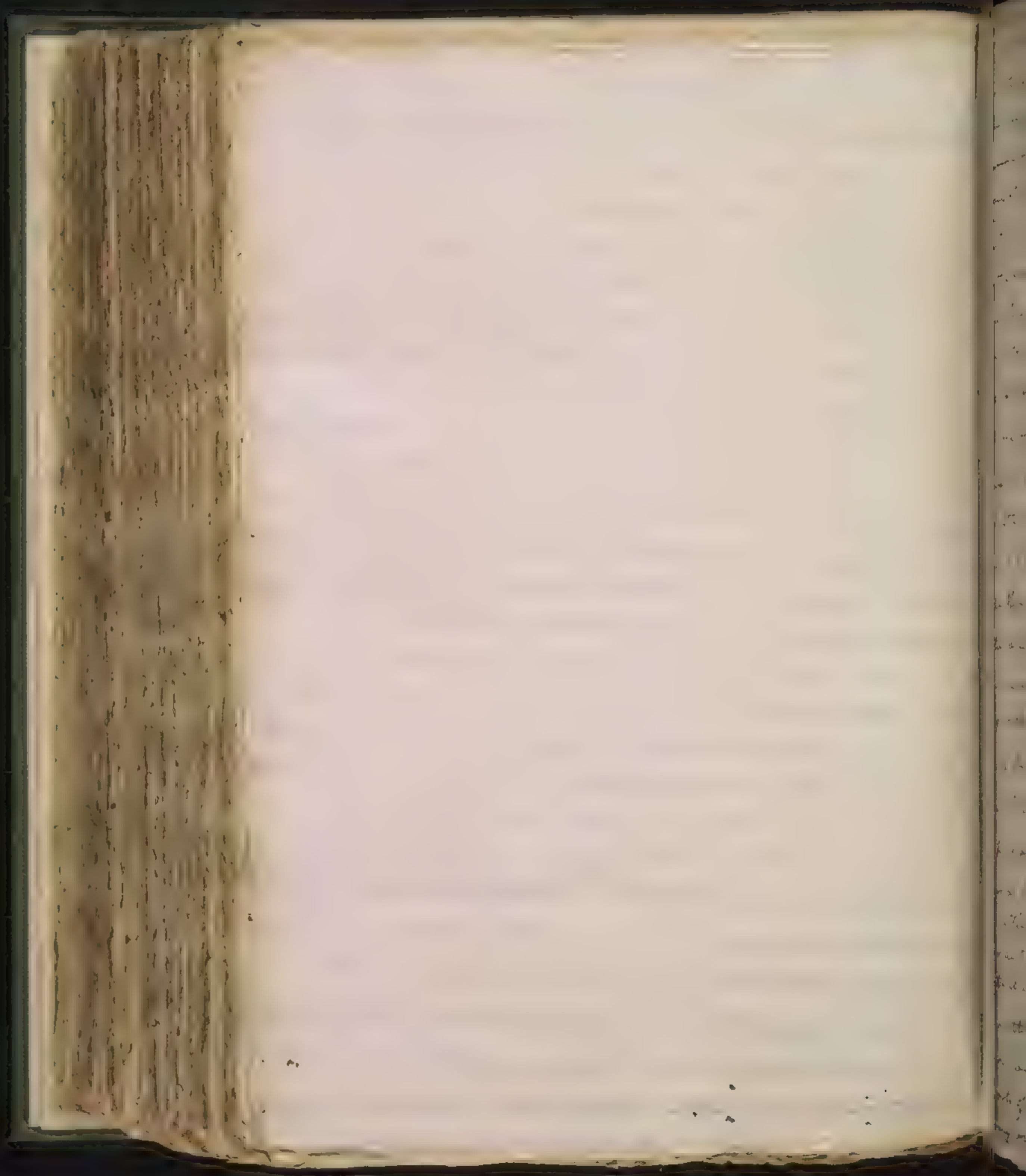
pellide



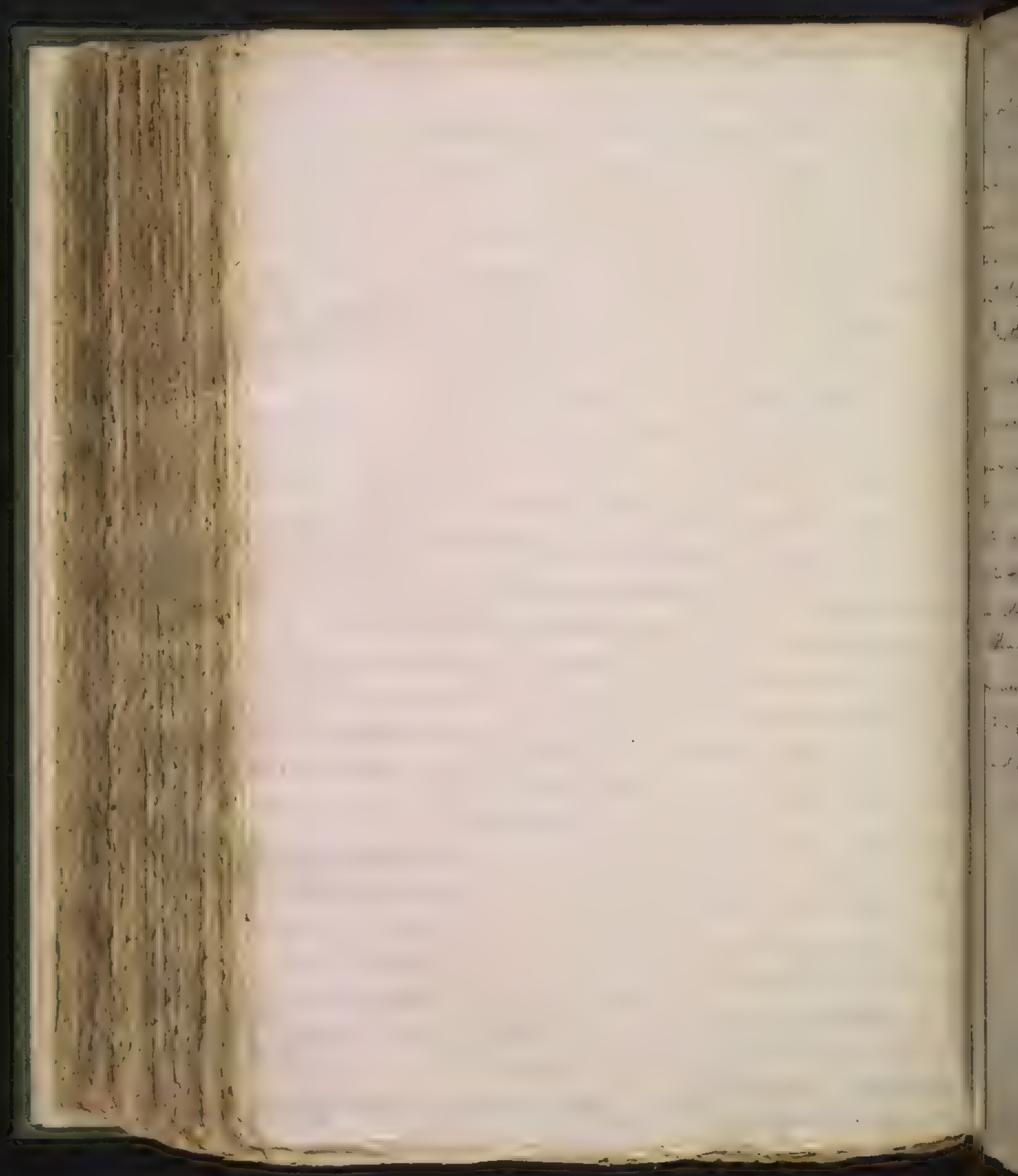
labeled The Mercury thus purified is not so proper for
treatment. When it is weakly impregnated with the ~~the~~ it is
more easily divided and is called lean Mercury.
In the plaster mentioned in the Syllabus mercury is
combined with the common ingredients of plaster.
In this state it is employed for discharging humors, hence
the mercury is so entangled that it cannot enter the
pores: By improving the perspiration and relaxing
the skin these plasters may be of service and answer
the same purpose as any other. I have met with two
kinds and with but two in which it is combined. The
thickest never enters the pores and that this may
more certainly take place the skin should be previously washed with
warm Water. The turpentine which is used to fill it is
(is vulgarly called) before the Hogs cord is added is often
useful. The turpentine attracts from the urine. The
urine is expelled by friction and irritating the skin. It is most
only hurtful when the ointment is used as an injection
in the venereal disease. It often hardens the veins
and is now better prepared for with some oil
of ~~the~~? This is more tedious but it answers
for the trouble of making of it in this manner or it
now prepared in the London Hospitals. The Pills
require no explanation. A Mercurial preparation called
Plunk's Solution has lately entered into Medicine where the ~~the~~
is aided by saturating it with Gum arabic. Mr Plunk was no chemist
he didn't let him to combine mercury with life and substances
in the skin after trying many. When he used animal and vegetable
he found it united best with gum arabic. He was not the
one he had an attraction for the mercury, but he was
wrong, I
in all



wrong for the mercury is only divided and no chemical mis-
ture takes place. The Stone Attraction magnet is used as it is left
when next is the addition of a thin solution. It is necessary to
know that this is not the case with the 11th Plank's solution &
an unaccountable waste part of the mercury is consumed by tri-
pling the greatest portion is recovered & by so doing the standing
down is a small quantity of the mercury is consumed is very
apparent when it meets with the acid of the Stone which unites
with it and forms a vegetable mercury. It is a delicate and very
sensitive. The famous Keyes' Process is made by putting a
mercury with vinegar till the mercury is reduced to a solid
when the mercury unites with the finger then the acid
mercury being introduced to a glass can be used for one of
the best anaphors of Boerhaave. The first round mercury in
a phial and fastened it to the coil of a wind Mill and up-
found it to revolve 14 years, no change however took place
and he found none any of it remained, but this was owing
to the smoothness of the Phial, as the mercury would have no
interior motion and it melted against a polished surface.
Mr Sanders put a pound of mercury in an iron box with
some nails and fastened it to a water wheel and in a
journey of 400 Miles calmed it in a grey powder.
The 11th Plank was not right in his theory and obliged
him for his discovery of a new method of getting mercury
which newly salivates and is seldom attended with the
inconveniences of the common preparations. It is of use
to multiply the soft and mild preparations of mercury
and to alternate them often. He will make the system
useful



... able to receive preparations while it remains more sensible
so others thus come with less the solution of some or an ultimate
better than any other preparation while others will lose the solution
of some sublimates all except this. I may ask us how
useful it is to various medicines and how it may improve
the virtues by giving one medicine of a class at a time and
when the stomach has become insensible to this we may
give another of the same class but of this more hereafter when
we come to speak of the composition of medicines. The Mer-
curius Saccharatus and Mercurius Sublimatus contain mercury di-
oxid only and not calined. They are bland and the former
superated in sufficient quantity to neutralize the acrimony
of earth which adheres to the mercury, it unites with the
acid part. The next class of mercurial preparations
include those in which the mercury is calined by heat. These
are of the same nature as those calined by friction and have
the same medicinal virtues, and their action depends on their
meeting with an acid in the stomach. When they meet with
the acid they form an acid, negative, according to the
acid in which they are given. They differ only in their man-
ner of preparation. The next are those combined with
sulphur or Camphora antimonii and Ethrops Mineralis
little need be said about them. Preparations the
sulphur destroys the activity of the mercury enters into the
time with it and forms a bituminous quid which loses the vir-
tues of neither and need not be supposed at this from
what we have seen of the effects of sulphur upon orure
that hosts of sulphur added to one of orure deprived it of its
activity entirely and it may then be taken without harm.



The Elthops Mineral is an ingredient in the Celebrated Worm
powder which was employed by Dr. De Witt of Germantown.
It is only an ingredient because the Bone is Beers foot
in which all the other virtues depend the Elthops only serves
to color and disguise this venereal is as most as the Elthops
mineral. The Venereal Antimony and Jacksons Cin
nabar are equally most with the same
The next is where the mercury is rendered solid by the
acid by the volatile acid these are the best mercurial
Venereal powder and Mercurial mineral This last I made
use is used as an emetic in the venereal disease but it
is of greater consequence in the first stage of the venereal con
disease. In this case it often gives immediate relief and
brings the disorder to a crisis. It stimulates and excites the
parts of the throat into action and causes them to pour forth a
mucus different in quality and greater in quantity than ordi
nary With regard to the preparation of mercury with the Vi
trious or mercurial acid we need say but little they are
useful when given internally in large venereal sores and howe
ver it is not in venereal fungous ~~or~~ excrements from
ulcers

as it does upon mercury when a little warmed but it

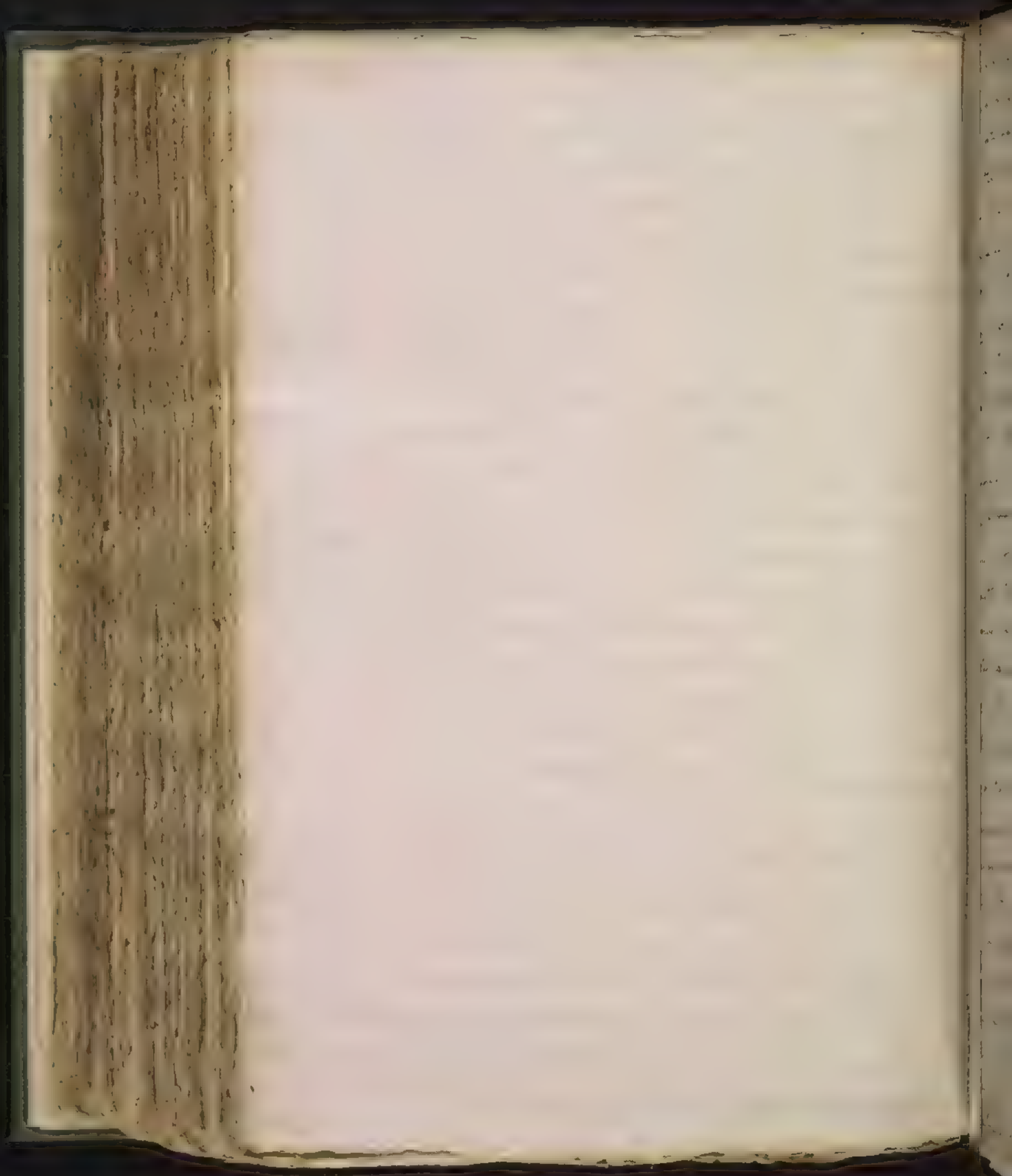
Antimony

The metal has been so much wrought upon by the chemists as that
very many different preparations have been made of them one
resembling or very much resembling each other but they do not de-
scribe the nature of Antimony is a hothead type of chemistry in the
regular form and when combined with sulphur in a red
antimony it obtains the name of regulus antimonii its being re-
acted, and found in the hollow of the crucible in the form
of a little crown after the deposition of foreign matter. It is
a light metal of a regular structure consisting of 60 met-
als disposed in a regular form the ductility of antimony
is nearly how dare it the specific gravity is to that of water 5.5
it may be fused in a red heat but the heat is more moderate it smokes
the vapors and combined they are found to be a dark antimony
in a gentle heat it becomes a white solid it has been raised after it
dissolved it may be fused into a yellow glass. The Nitrolic acid act-
ing upon it but the acid must be highly concentrated the vapors
rise upon mixing these are of a strong offensive smell. They are com-
posed of the $\frac{1}{2}$ of the Regulus and of the Nitrolic acid and one third
of a true sulphur. This is one of those metals that attract
the Nitrolic acid stronger than tin.

Antimony does not combine chemically with
it not corrodes it and after standing 12 or 14 hours upon concentrated
into a color, the acid always acquires a blue color and emits
strong red fumes which are occasioned by the various acid upon
being the $\frac{1}{2}$ from the antimony. The Nitrolic acid acts
upon it only when diluted, it is therefore necessary to add
nitrous acid to detach the $\frac{1}{2}$ in some cases. The true
acid an aqu. regia which is the only proper solvent of Regu-
lus of antimony and in this respect it is the same as being



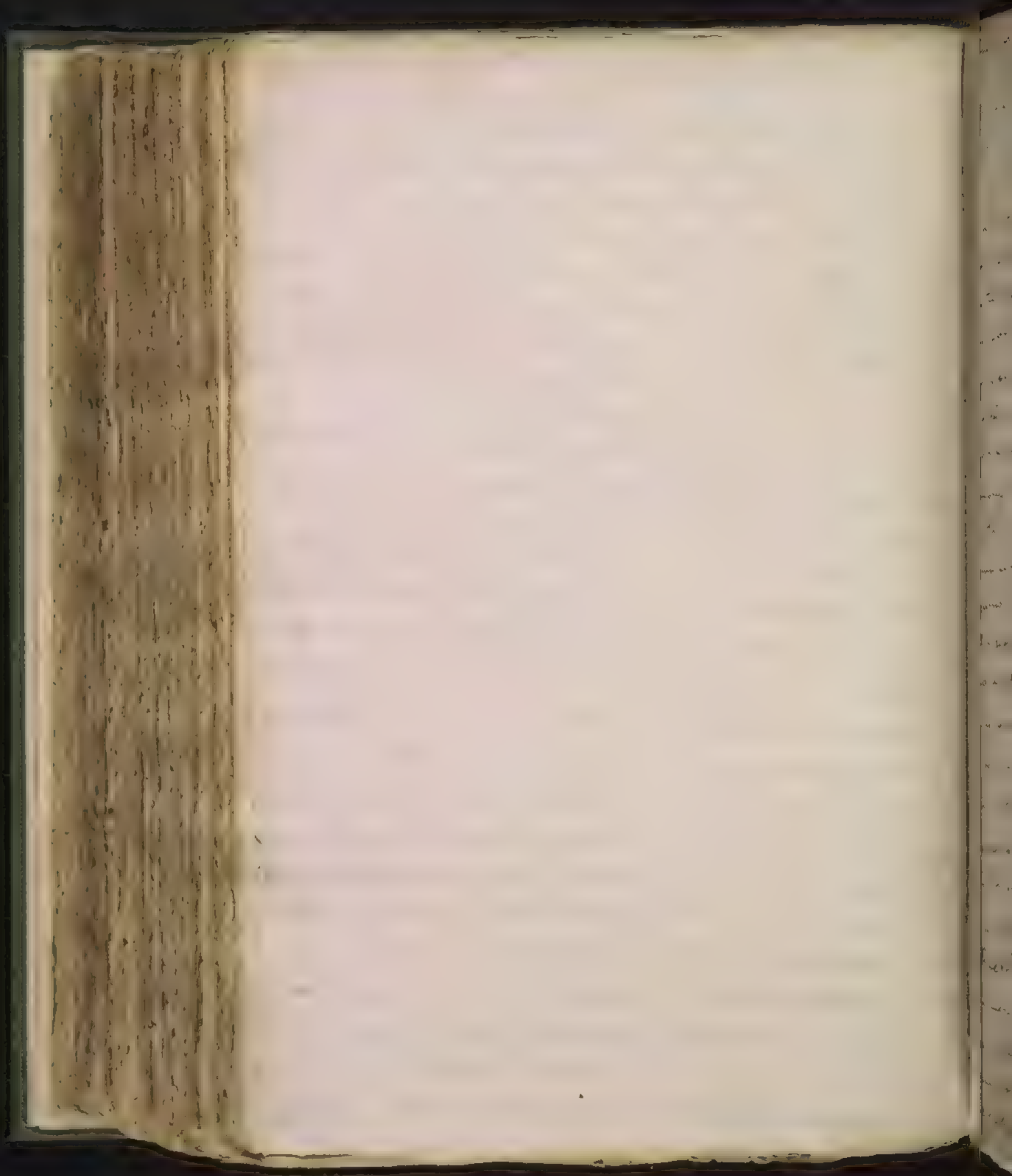
on a footing with ~~even~~ gold itself. There is another way by which
the muriatic acid may be combined with regulus of antimony
making them meet in different ways viz by mixing them
in a sand and antimony well powdered together and distilling
down a gentle heat. The Water with which the muriatic acid
always comes mixed is stronger, that it comes with
with just some on the lower in muriatic acid and with
antimony with the rest of more over muriatic acid
the green and water the acid runs on and the regulus
is called butter of antimony. The color of the
regulus is covered by the $\frac{1}{2}$ of the regulus of antimony and after
in a few hours in the rest this butter of antimony is
very caustic and vomits and purges most violently
distilled a second time it becomes more pure after some
cooling the portion of a mass of from a blue thing
is taken from the air which is condensed in the vessel
like rose becomes fluid by being exposed to the air. This
generally runs in a fluid form in the top of the vessel the
brown acid or water it will be decomposed if a small
quantity of water be added to either of antimony the antimony
will be precipitated in the form of a powder running either
into a fluid or the acid this powder is some measure
into the very impure as it does not contain a portion
of mercury and is very acid that it may with
more justice be called mercurous Mercur. It may be
rendered mild by washing in water. In adding nitrous acid
Butter of antimony a slight effervescence will take place
and Bezoar Mineral will be precipitated All the Vegetable
acids



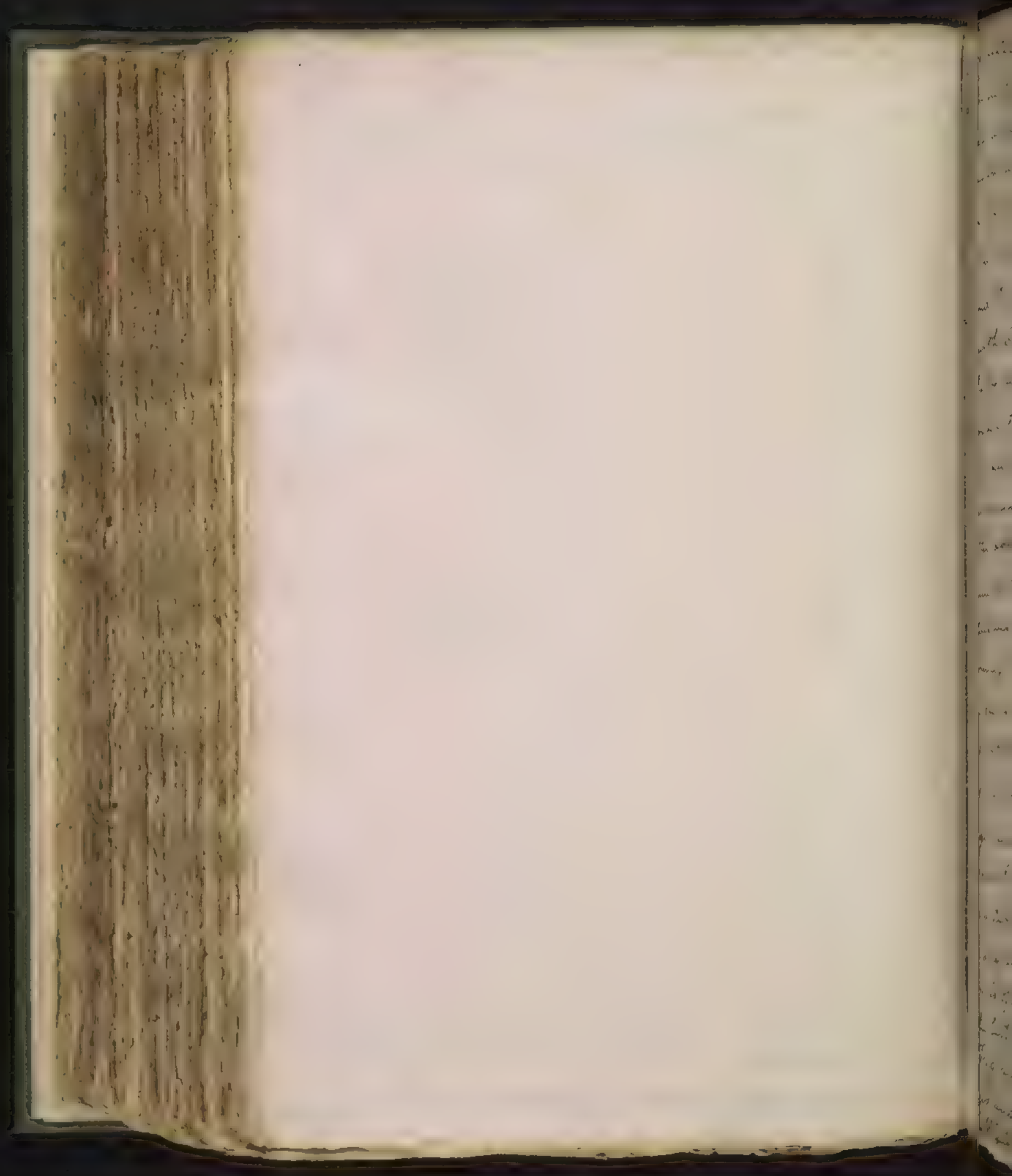
acids act upon antimony in its metallic state. Equal parts of tartar and regulus of antimony in fine powder are boiled till the tartar is saturated the solution is strained and set to crystallize in the tartar emetic. It should be crystallized in silver vessels. Iron and copper will decompose it and precipitate the antimony. The alkaline salts do not act upon antimony when it is freed from its sulphur. It is combined by nature and in the laboratory be deflagrated together it is called the Cornu de Antimoine. The Regulus in this Cornu is reduced to a globe by the acid of the nitre. It is called Cornu from its resemblance to white lead. Bartholomew Bodie has no action on antimony. Of the inflammations sulphur is what most strongly attracts it. Sulphur changes its color and becomes sulphur is sometimes found combined within the bowels of the earth. There is one preparation by digesting the regulus of antimony in highly concentrated vegetable acid obtained from Verdigris and afterwards distilling it with so much oil will blunt and destroy the acid. This is a safe preparation for the spirit of antimony imports so much of the outer covering or the vessel as mild. It is used by some on a lower part and over the stomachs are particularly fond of it. Regulus of antimony acts on most of the metals. Margraaf's method of combining it with Mercury is the first of its kind and after all admits of no application in medicine or the arts. It is in solution in water in its metallic state. It is rarely found in a pure state. Heberon on account of its being found in the East Country in Bohemia in Sweden in a pure state. It is generally mineralized and combined with sulphur and sometimes with



with a little arsenic. We are next to speak of the effects of heat and Moisture on the Ore of antimony or many of the preparations depends on a greater or less separation of its sulphur. The Ore of antimony is black and weighs the fingers when handled it is composed of iron, mendeleeff, iron, and iron. Lead and arsenic, or lead, the sulphur and arsenic are separated and the metal is reduced to a mass. This is more or less and as it is more or less reduced from this we may receive a varying introduction in the weight of Hoffman and Boettcher. Hoffman states that this is an antimony. Boettcher says that it is an arsenic and dangerous in its use and prohibits it to be given internally. It is probable that in these cases the antimony was differently prepared. If the arsenic is other way the effect of antimony is obtained. There is a preparation called *Diuretic Antimony* which is a mixture of antimony and arsenic. This is generally combined with heat to separate the regulus from its ores. All the Mineral acids are used to separate and used to dissolve it and thus separate it from the matters with which it is combined. It is fused, melted and afterward removed by melting with some inflammable matter. Antimony may be combined with arsenic and by a double selective attraction Corrosive Sublim and the Ore of antimony are put together into a retort the Moisture and unite with the regulus and runs with it into the receiver in the form of Butter of antimony. The Mercury unites with the sulphur and forms Cinnabar which from the Manner of preparing it is called *Diuretic* or *Antimony* but improperly as there is not a *Diuretic* of antimony. The alkaline salts and unimpure are used to separate sulphur from Reg. antimon. or they



combined with the sulphur forming Hepor sulphureum which
is the Regulus. This compound is dissolved in water and
the Nitrous acid added to it a sulphur is precipitated of a golden
color called sulphur auratum antimonii. After the acid
is removed in a solution of calcareous salt and then
strained a powder remains called Kermes mineral. It
acts upon antimony
By this the Regulus is separated from the sulphur Kermes
directs 1 part of nitre 100 of antimony the antimony should
first be roasted and mixed with charcoal. There is another
which the regimens is separated by ^{dehydrogenation} passing 12 parts of butine
of nitre and 3 of tartar together or by throwing equal parts
of antimony and black flux into a red hot crucible. There
the flux removes it from calamine and the
sulphur is in small quantity that it cannot be
the Regulus, they should be thrown in gently to prevent too
violent a deflagration. After they are melted they should be
poured out into another crucible the bottom of which
should be greased, the bottom of the crucible should be
beaten down and then to make the regimens inside to the
bottom. This by deflagrating equal parts of nitre and
antimony together that we get the regimens the following
when but a small part of the antimony is consumed, the
regimens and purges most violently. The operation
White Boethavii by deflagrating two parts of nitre and
one of antimony, in this case all the sulphur is separated
and more of the regimens is consumed hence it is much whiter
and softer than the others. Diaphoretic Antimony
or black antimony is prepared by deflagrating one
part



part of antimony with 3 of Nitre. The As is dissolved
and the metal entirely consumed during the operation. The
nitre by melting uniting with the vitriolic acid of the sulphur
is converted into a vitriolated tartar. This sometimes, called the
tarn. The history. Whether of these preparations
any of the virtues of the antimony. The Panacea Mercuri
alis and Dr James's Powder are made by deflagrating
nitre with Brimstone antimony. In James's powder there
is probably an addition of mercury. Of the 3 acting bodies
the water is the only body that acts upon antimony. If the
fumes of antimony are dissolved in lime water a golden
precipitate of antimony may be precipitated similar to that
from the alkalis. Antimony has no attraction for me-
tals. It is a combustible body owing to its being already saturated
with sulphur. There is a composition called the mixture
of antimony which was thought to be a solution of it
in spirits of wine. But in this case it is beyond
mixed with an alkali this forms with the sulphur
before sulphuric which is dissolved in the V and
the mercury. It remains untouched. All the
metals except gold act on the Regulus of antimony. They
all have a stronger attraction for the sulphur than this is.
may be allowed the exception is its constant addition
in the bowels of the earth. Iron is most generally employed
and in the best it attracts the sulphur. Iron ore is then
called Reg. antim. martell. Jovialis when tin is
employed and is of the best. The ore of antimony is in-
soluble in Water.

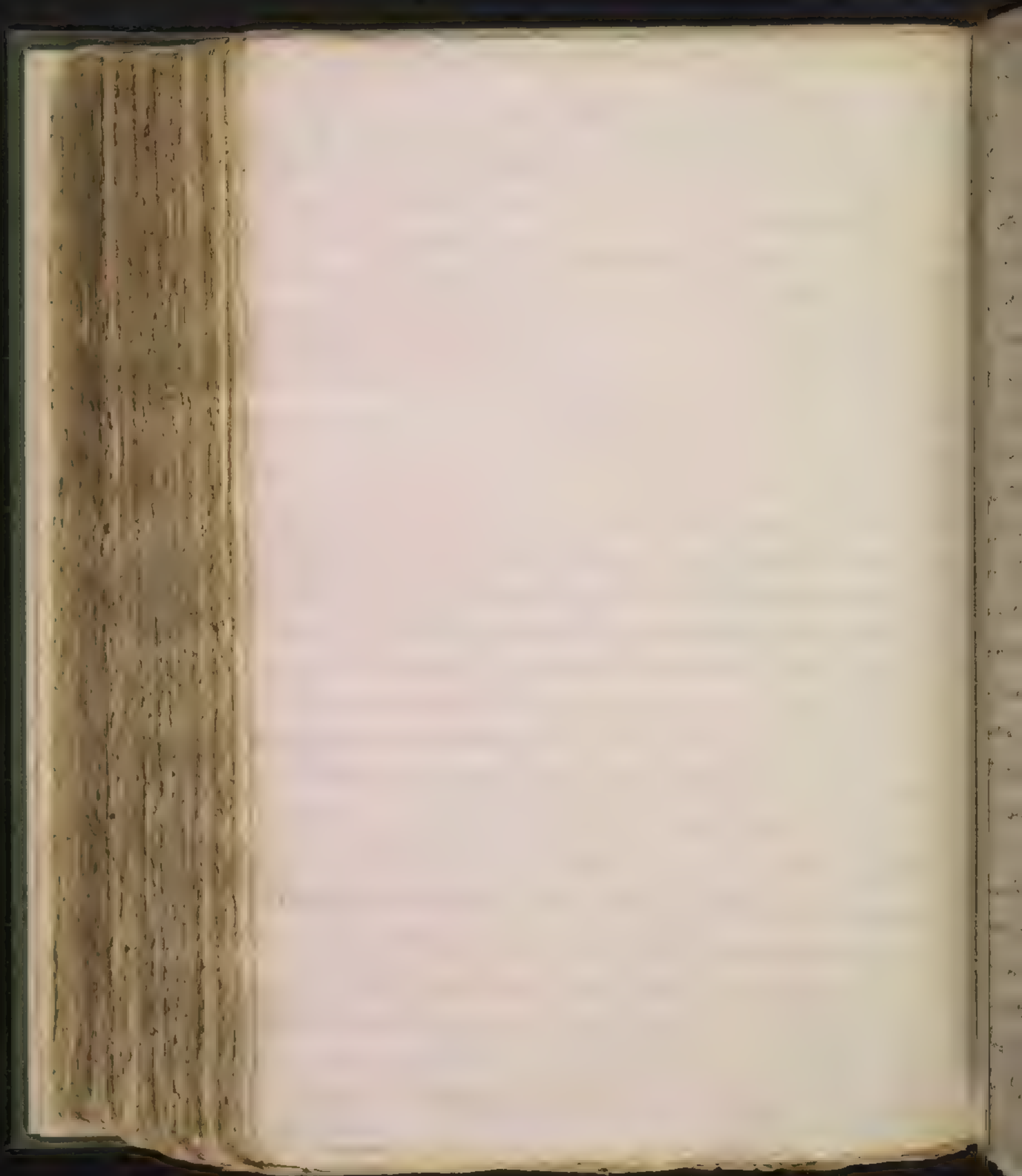
Linc



Time

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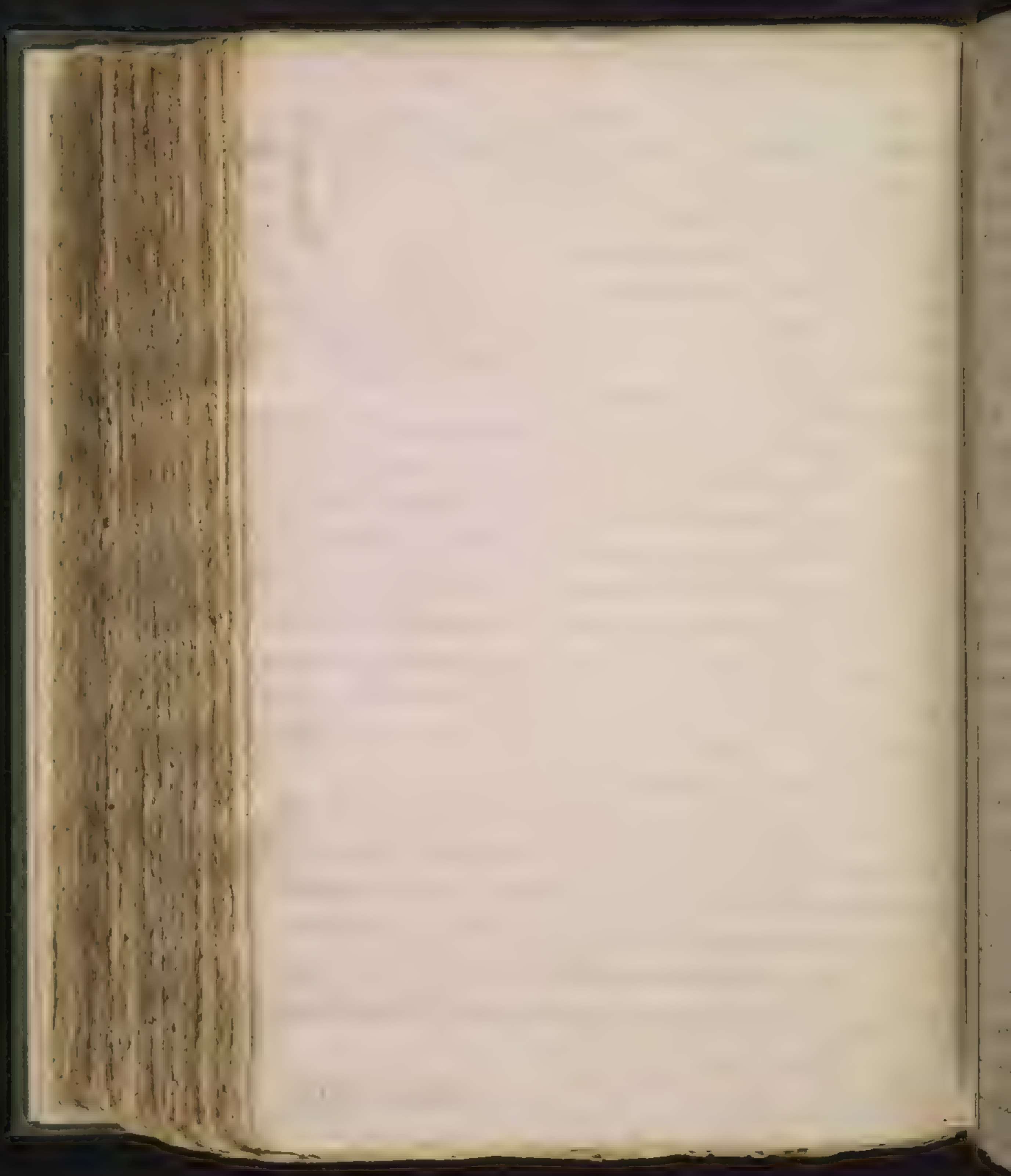
relation? Upon adding the nitrous acid to Lime red fumes
 extracted which are very inflammable and will explode
 when a candle is applied to them this explosion depends on
 the gas in the vessel being induced by rendered elastic. This gas
 which is here extracted from the lime is united with
 some metallic saline or watery substance or it is not in a
 gaseous state in a separate state in vegetable acid discharges
 and gives a reaction to the acid & remains with the
 lime. Morphine might depend on a separate
 gas of the lime which the salts have no as-
 sion upon Lime Nitre deflagrates violently with it bar-
 ing from it its principle of inflammability. Nitre cannot
 be combined with it on account of its being
 in a gaseous state may be decomposed by distillation
 with Lime the moisture and water with the lime and
 the volatile alkali over into the receiver. Of the parts it
 unites



under with clay forming lapis balamensis no attraction for the Δ when melted and that it working insoluble among the chemicals. It is not melted. The flowers of Zinc Margnat has taught us that the flowers of Zinc may be reduced to their metallic state by distillation with 1/8 of charcoal or Lamp Black in close vessels it will not do in open vessels as the Zinc is deflagrated in vapor or lost as it is revived it will not unite with sulphur since this may be used to operate it known other metallic substances, particularly Lead. It unites with all the metals except Platinum and Gold. With tin it forms the pewter, the pewter, brass and made of Lead with some Zinc. It is also used in making Brass; it is a metallic substance which not only preserves the color but many other properties of Lead is composed of zinc and copper. In this manner the zinc is mixed with charcoal dust and melted with small pieces of copper in a crucible. The Zinc is then exposed to an intense heat melts and is converted into vapor, it then unites with the copper. The charcoal serves to support the Δ and is insoluble in water.

Zinc is found in all rocks, in the Alps and in the East Indies. It is sometimes found in the State of Calx. It is combined with sulphur and is then called Black Lead or Black Jack. It is most frequently found combined with Clay forming lapis balamensis, for the Methods of separating it see Chemical Books particularly Neumann.

Bismuth



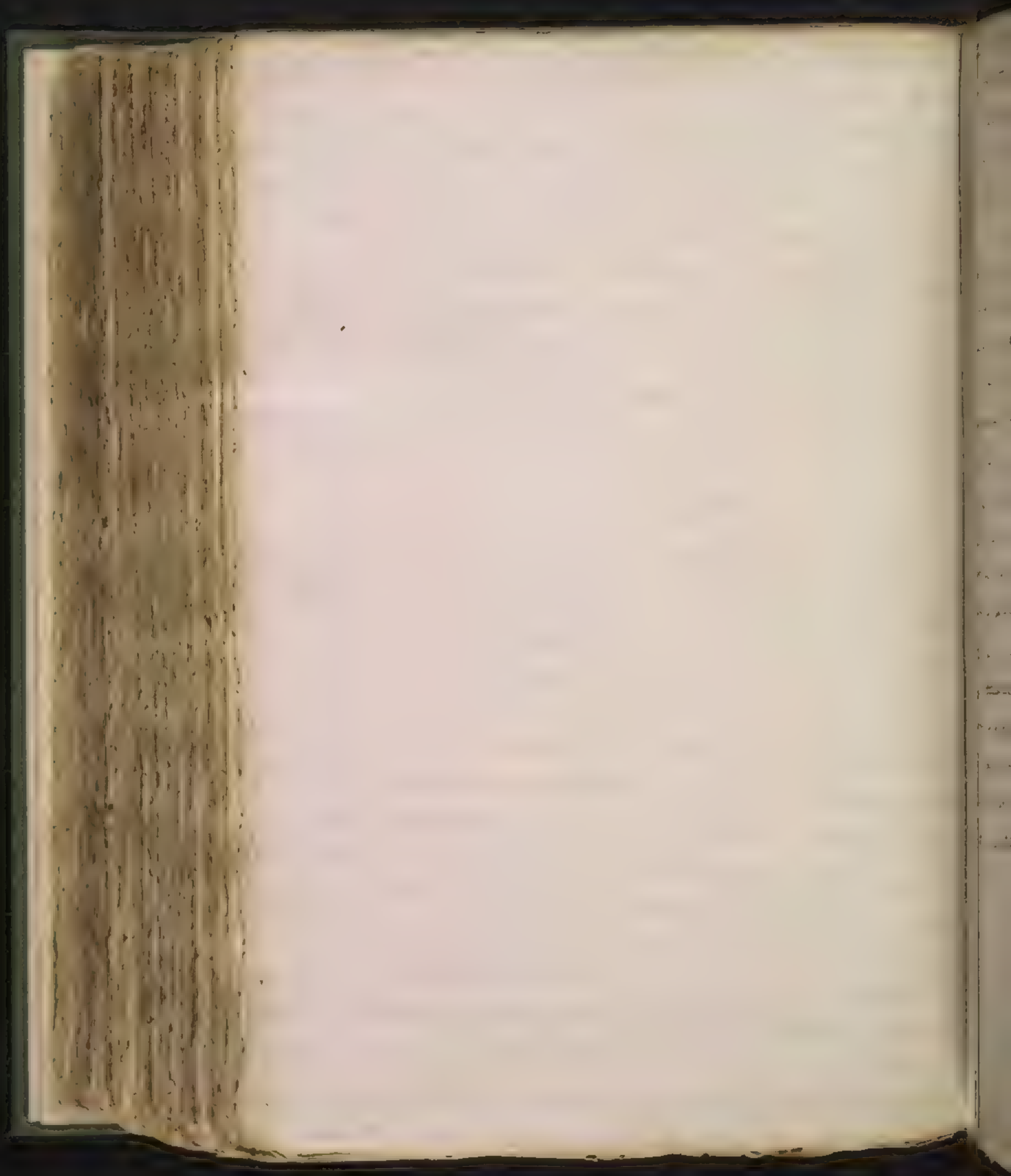


corrupt flux to all earthly substances. Of the inflammables it unites
with Sulphur when calined especially when burnt in a closed
all its power of inflammability and is united to Sulphur
I remember an Oracle under with all the metals except
Lead and Zinc. It is not joined to Bismuth and the
mercury when mixed over any vessel's glass than or less
if it always appeared as in used or Zinc. It is mixed with
or mixed with Lead in mixed used in making pew
and printers types. It is insoluble in Water.

It is found in many parts of Europe & in Cornwall
in England and Bohemia. The Method of separating the
Sulphur from this metal is by means of heat.

Cobalt

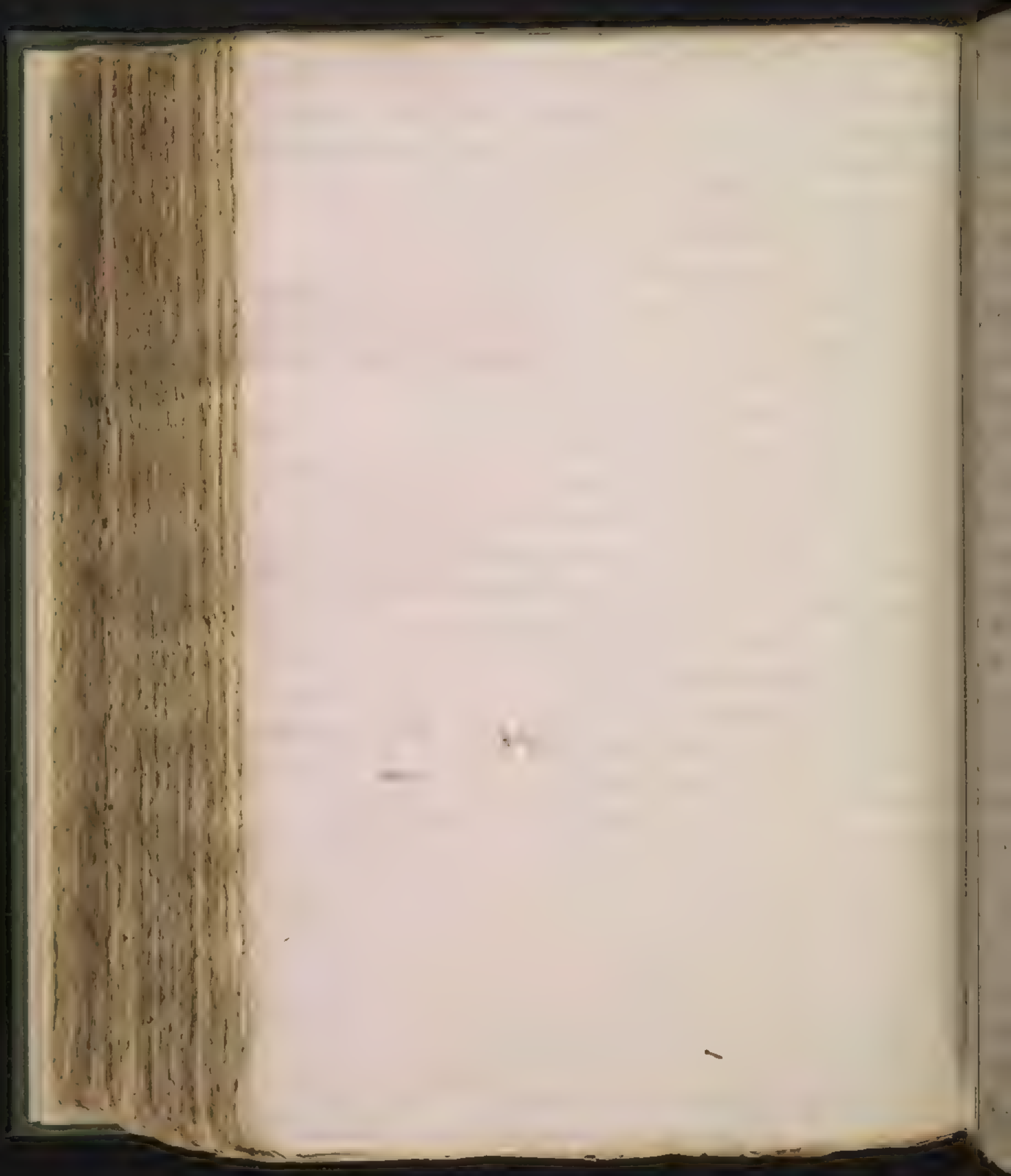
Cobalt is of a whitish grey color hard and brittle and is found in
the first. It is calined by heat and its color is of a black color. It
is the mineral which is used to separate it and extract a red tincture
from it. It is dissolved in the nitrous acid. In addition
it is a solution of common salt forms a Symplic that is
used in dyeing and a certain quantity of the same is used
in the manufacture of ash that is used in forming. One
part of Cobalt, with 2, 3 or 4 parts of Arsenic
makes Lappet. Lappet is of a beautiful blue color and
is used to tinge glass or porcelain. It has a strong at-
traction for the ϕ and when combined with it forms a
most metallic substance which is called regulus of
Cobalt. It is found combined with Sulphur in the Boer.
It has an attraction to all the Metals
except mercury and Bismuth. It is insoluble in Water.
It is found chiefly in Saxony from which it is never exported.



tal but in the state of smelt it is found 1st in the state of a color
2nd with the ore of arsenic 3rd with iron and arsenic in a Me-
table state 4th with iron and Sulphur, costly with Sulphur the
arsenic and iron The Sulphur is deposited by heat the same
times blended with the ores of Bismuth.

Nickel

Nickel is of a whitish color when it is red if a solid texture and
shining when broken it is used in the fire and converted by
oxidation into a green color not fusible and used to color glass
iron or red. Its specific gravity to Water is as 8 1/2 to 1. It
is dissolved by all the Mineral acids and gives to them a green
color The precipitate from the acids is sometimes of a solid
nature. In solution it gives a blue color. It has little at-
traction for oxygen but attracts Sulphur greedily, and it
might be used to separate Sulphur from the other metals for
example. It is called Nickel from the word Nickel
because of its giving a green color to the mineral acids
it was ~~thought to contain~~ supposed to contain copper
but was afterwards found not to contain a particle of it
it was discovered in the year 1751 by W. Cronstedt.
It is found in different states, as in a ~~blue~~ color, with
cobalt with arsenic with Sulphur and Iron.



We are next to treat of the simple or impure Metals and first of
Lead

This is remarkable for its malleability and ductility. It is so soft that when exposed to the air and becomes black or green. Its specific gravity is 11.34. It melts in a gentle heat. It is malleable, rather than brittle. It is heavier when it is impure than when it is pure. It is so soft that it can be drawn out into a wire. It changes its color and becomes first of an orange color that is called litharge and is much valued by the painters. The chemist for this is called *lithargium*. Its color is more according to its purity. A fair or deeper yellow. These terms were first introduced when lead was supposed to contain gold they are now obsolete. It is found never to be used as it is found not to contain a thing either. After this it changes and is called *Minium* or *Minerale* by the painters. In order to produce this red color the flame must come in contact with its surface and the heat below must be very intense. If the heat is less than this the color will not appear red. The heat should be too intense and one should come near and then stir it with a rod to prevent stratification.

The vitriolic acid is used to form a compound with it. The Muriatic acid is diluted with an equal quantity of water. The vitriolic acid is added to it and it turns it into a white powder. If added to it in a fluid state it turns the acid vigorously mixed with mercury in a corrosive state. It unites intimately with the lead. The lead may be intimately united with the muriatic acid by distilling it with sea sand. If the this compound be melted then it is called *Plumbum Corneum*. The vegetable acid turns it on it but slowly when it is in a metallic state but by moving it.

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now rapidly when it is in the state of a cake and then dissolving
it intimately. Camphre is formed by exposing thin plates of lead
to the vapor of vinegar and suffering them to be corroded a
white powder forms on their surface which is removed upon
washing them. saccharum saturni is made by boiling thin
slices of lead with vinegar till crystals appear. The saccharum
saturni may be decomposed by alkalies or fire, whence the acid
may be obtained by heating a very concentrated salt. An acid
is formed from the union of the ϕ and the acid of the
saccharum saturni. This acid has a strong attraction for the
 ϕ and carries it over with it the ardent spirit has a weaker
attraction is formed of an aqueous acid the ϕ and water. The
salts do not decompose. The Neutral salts where is the chief
which acts upon lead it dissolves with it ϕ and calcines it. I
before told you that the acetous acid. The Colic of lead unites
with most of the earthy bodies and converts them into glass. It does
not vitrify clay. Hence clay vessels should be used to contain it
glass of lead in fusion. Common crucibles which generally
contain sand will not do or they will be vitrified. When
mixed with flint it forms white glass which is so much used
and valued. It is this which we generally employ for chemi-
cal vessels, these are sometimes reduced when exposed to an
intense heat with the crucible. It is often reduced by the flame
of blowers when it touches the bottom of the Candles. We
should never use retorts but such as are very clear when
we are going to distill oily substances. Potter owns their beauti-
ful appearance to the Colic of lead which is mixed with them
more especially which resemble diamonds They are sometimes
yellow like the topaz and of this the yellow beads are generally
made



mixed. The yellow green and black color of the northern wood is owing
 to the color of lead which is mixed with water and melted over
 them before they are pressed. This meets with the acid and unco-
 mingles with the vessels. This greasy or oily mixed is soluble in
 ... we should be cautious not to use any thing sour which
 would congeal in earthen vessels. mixed inflammation
 substances act on lead. The mixtures are mixed with its
 color forming the common plaster. The attraction of the
 color of lead to the principal ingredients is great that
 colors which are mixed with this color or red lead may be
 caused by first greasing them and then turning them with
 a bundle of hair or using a thread to mix them in it. metals
 and minerals stick to lead without mixture and in
 its solution the attraction is great as to sulphur but when
 combined with it no fire is formed. When lead is revived
 from its color it appears black. This leads to the discovery of a spec-
 tific ink sulphur in its simple state is not volatile but when
 combined with an alkaline salt or even in the form of Hepor
 sulphuris or osperment it is very volatile. I have doubtless here
 before with a solution of Saccharum Saturni in water and
 laid it over the fumes of Hepor sulphuris or osperment the paper
 will turn black thro' 100 leaves of a Book. This is the best of lead
 known another, but is a curious amusement as it discovers the
 presence of lead in wine which is sometimes put in
 to sweeten it if the wine contains a portion of lead it be-
 comes turbid immediately upon adding a solution of Hepor
 sulphuris or osperment owing to the strong attraction
 which the lead has to the S. From what we have said we
 may understand how it is that Hepor sulphuris prepared
 with



with a vegetable alkali forms vitriolated tartar and that prepared
with lime Selenites from the $\frac{1}{2}$ of the sulphur escaping and leaving
the vitriolic acid behind which unites with the alkali or lime
overcoming the strong attraction that the Colours of Lead
have for the $\frac{1}{2}$ would it not be better for the Farmers to
mix up their Colours with water instead of
and convert metallic substances into vitriol of the
acid in purifying rivers and shall speak another method
will not unite with iron and when mixed together they form
no permanent salts.

Antimony. It is found first in the state of a Colr 2^d with arsenic and
oleaceous earth 3rd with sulphur 4th with sulphur and silver
5th with sulphur iron and silver and lastly with sulphur
antimony and silver. It is separated from its ores by melting
with the black flux or some inflammable substances, it is
obtained from silver and copper by exsiccation. It is
found in almost every country in the World. —

Mer

This is a white silver colored metal malleable and not so
corrosive capable of great ductility or rather extensibility its spe-
cific gravity is 19.3 in water or 7 to 8 it being the lightest of all the
simple metals. It melts under a red heat, in the interior
state between solidity and fluidity it is extremely brittle
and when struck with an hammer may be broken into a
thousand pieces, if poured into a mortar and mixed while
in a state of fusion it gives us the white stannum if the heat is
carried beyond the melting point a calx is formed, this calx is
white powder which cannot be vitrified by the most intense
heat or most powerful fluxes we are acquainted with. This
stannic acid when highly concentrated and agitated by heat
corrodes

III Tin deflagrates with nitre and is calcined

unites it uniting with its S and thus forming a true sulphur
the nitrous acid acts on it with violence tearing from it bits
of the tin shown to be added in small pieces to, several too great
in consequence. The solution is not permanent the nitrous acid
deposits part of the tin probably from being weakened by the
escape of the S it is used by the dyers in making cochineal
a bright red. The mercuric acts upon it much in the same
way as upon regulus of antimony and dissolves it slowly, when
applied to it in fumes by distilling it with double its quantity of
mercuric it unites with it intimately and the substance
formed from it in manner of it, its evaporation is called
Butter of Tin this emits strong fumes in the air and hence
its inventor is called Liquor fumans Libavii. Aqua Regia
dissolves it intimately. The vegetable acids even the weakest have
been found by Margraaf to act on tin: this refutes the common
error that reflects that our tinware is not acted on by
acids but a more necessary caution arises from considering
that no metal attracts arsenic more than tin does and that
the purest ores of tin contain arsenic this was first proved
by W. Geoffroi and since by Margraaf. The weakling noise
in hear upon heating tin plates is owing to the arsenic they
contain. Also Lincolns have no action on tin. It has a draw-
ing attraction to borsting bodies enamel is formed from a mix-
ture of tin and glass. It readily unites with sulphur. It has a strong
attraction to all the metals destroying their natural lustre this
the smallest quantity of the fumes of tin coming in contact with
gold or silver renders them brittle and unfit for use. It is
used to give hardness and elasticity to many of the Metals
tin hardens Brass and when mixed with it is called Bell
Metal



metal which is used for making Balls and is an ingredient in Brass
Cannon. Tin is the Basis of Pewter. When amalgamated with Mercury
it forms a foil for looking Glasses. When this amalgam is sublimed
with Sulphur and Sal ammoniac, it forms aurum mosaicum
which is much valued by the Painters. The aurum mosaicum
is found at the Bottom of the vessel after sublimation. Tin and
Lead combined and united with Oil make Putty. The Solder
made use of by the Tin men is a composition of Lead and
Tin. The Ends of the instrument to be soldered are sprinkled
with resin and a red hot iron is applied to them which melts the
resin and they are joined together. Iron and Tin readily unite
The Utensils we call tin are only thin iron plates, put into
melted tin and the Drops raised on them and owing to the
melted tin running off. The fusion of the metals is, an ancient
by being united with tin. If Lead Burnt and tin are mixed
together the compound melts in a very low degree of heat
Houblong directed equal parts of each to be employed. But
is Isaac Newton improved it much by ordering 2 parts
of Lead 3 of Tin and 5 of Burnt to be used for this com-
pound. This melts in the ordinary heat of boiling
Water. It may be used in the room of the common sand
Bath; it does not evaporate like mercury. It is insoluble
in Water.

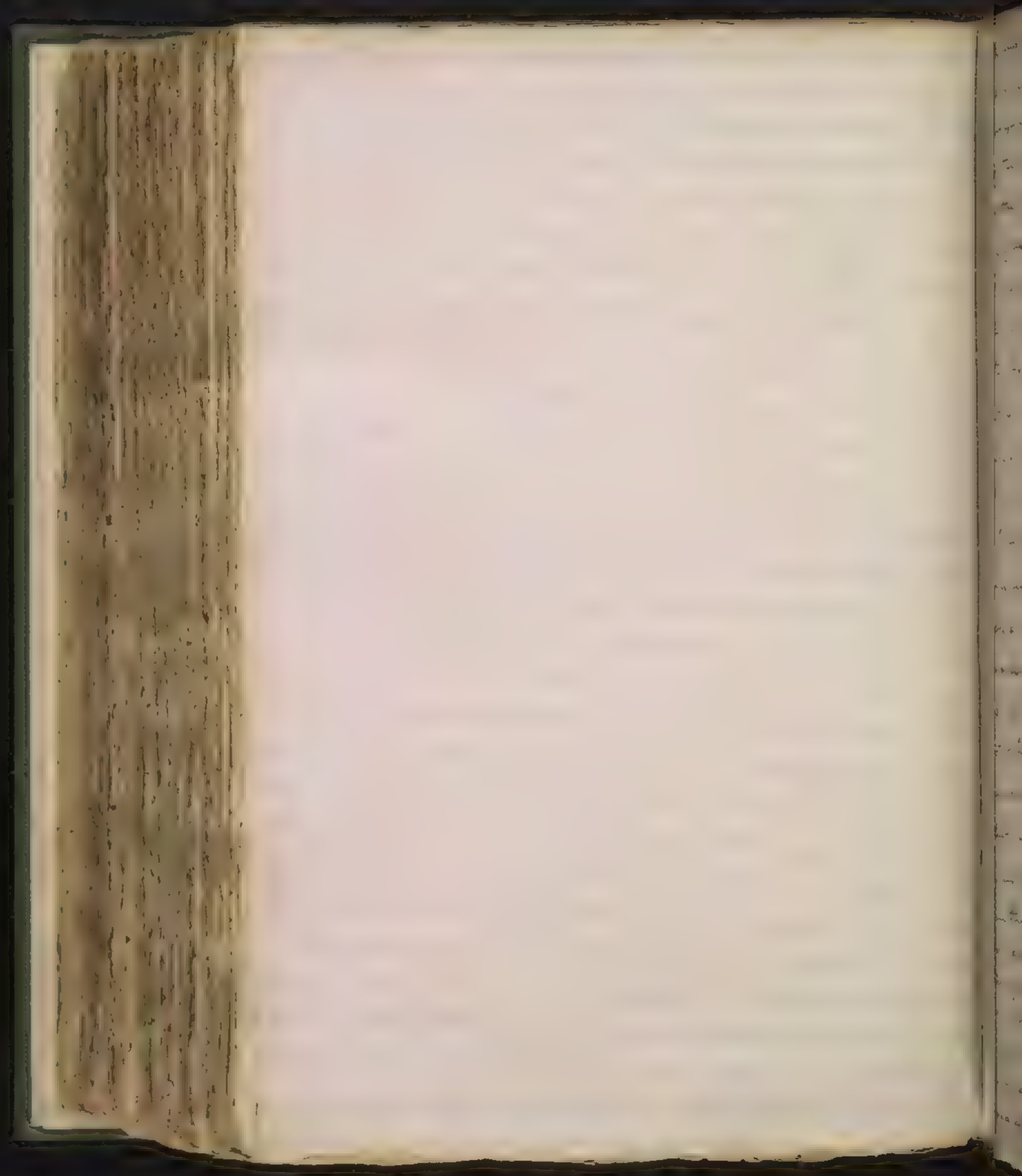
ing. Tin is found with Sulphur and arsenic or with iron
and Sulphur in what we call black lead but it is never
found pure. It is sometimes found in the form of Crystals
but are very heavy owing to a quantity of Stones mixed
with them. It may be separated by the rules that were
given when we were upon the Germania. It was long

It is not in a region of great snow but at which it melts a good
instance is formed on its surface which flies off upon being
struck and is found to be a carbon

in order to separate it completely from arsenic. Marguerite
is taught us that it may be done by putting it in aq. regia
the tin remains dissolved in the aq. regia and the arsenic
falls to the bottom in the form of crystals. The only prepara-
tion of tin used in Medicine is the *incis stannum*. The
and as recommended by some it is supposed that its action
isally from the figure of its particles and others by the arsenic it
contains. That it may act both mechanically and chemically

IRON

It is a greyish heavy very common metal. It may be extended
by the hammer when heated and when exposed to the action
of acids it is yellowish or reddish color but its most distinguishing
property is that it is attracted by the magnet. It ignores
with a soft heat than other metals but takes a white heat to
melt it. The specific gravity of iron is 7.8. That of iron ore
is 4.8. The property of iron is that if we take a mass of it out of the
fire just before it has acquired a white heat and blow on it
with a pair of bellows it will melt immediately. Iron
dissolves readily in the vitriolic acid with which it forms a
crystalline salt called green vitriol. It also forms a
this contains a good deal of water it undergoes a watery fusion
when the water is released by heat it is converted into a white
powder called calcined vitriol. When the heat is urged further
it becomes red and is then called *crisotherm* of vitriol which is
a form of iron. The nitrous acid unites with it causing it
to send forth fumes which are inflammable like those from
the vitriolic acid and iron. The *illumine* and acts on it
with violence and dissolves it when diluted with an equal quantity



Water and yields crystals like green vitriol. If this salt is distilled
it will rise in flowers then discharge their power of inflammation.
On the green color and brown of a brown or rufed color some
part of the Iron is still retained dissolved in the mucous acid
None of the acid retain iron so long in solution or attract it so
strongly as the mucous acid. It is on this account very
easil to detect the presence of iron in clay a yellow color
in this case is produced in the acid. Stains produced in
clothes by iron commonly called iron mold may be taken
out by means of the mucous acid all the vegetable acids
act upon it when dissolved in the vegetable acid it is absent
green then dark or yellow and at last deposits a yellow color
like ochre you see this at the edges and bottoms of almost
all the mineral springs. If the solution of the iron in the
vegetable acid be heated it hastens the deposition of the
yellow color. The yellow color given by 2 grains to 100 of the
mucous acid of iron deposited in stain over the dye
cannot be taken out by any thing but Mucous acid. Ochre
is used in painting. The rusting of iron is ~~also~~ owing to
vegetable acid generated by fermentation of vegetable matter
in the air. It has been precipitated iron from its solutions in the
acid in the form of a color or ochre. Lavoisier discovered a
method of dissolving the oxide of iron in fixed alkali. It is by pouring
a solution of iron in the nitrous acid upon a solution of an alkali
the iron is first precipitated but afterwards is redissolved. When
iron is precipitated from the mucous acid by means of a
particular alkali it forms the Prussian Blue. This was first
discovered at Berlin from whence it derived its name. This
alkali



Alkali is prepared by burning 4 parts of a pure fixed alkali (made by de-
flagrating equal parts of nitre and tartar) with two parts of bees
blood in a crucible which is exposed to an intense heat till no
steam or smoke arises, the crucible should never be filled more than
two thirds full. We may know that it has been properly prepared
when it precipitates steam from the nitrous acid without giving
it a brown or black color; when this is the case it should be taken
out and dissolved in as small a quantity of water as possible
4 or 8 oz will generally be sufficient to dissolve 4 lb of the
salt; if this is added to a solution of iron in the muriatic acid
the iron is precipitated first of a grey color this very soon
changes to a beautiful blue; this blue color must be owing
to something that the iron attracts from the alkali and this
again from the bees blood. The same is seen in blue
muddy substances on the surface of the earth this color is owing to
iron with a superabundant quantity of the salt. The lapis lazuli
of this kind the color of the water again was caused by the
presence of copper and bluish green was shown to be owing to
a portion of iron which can not be easily separated. Nitric acid
is common set upon iron nitre dissolves it. 1 lb of two
parts of sal ammon. and one of the salt of iron are mixed to
a solution in volatile spirit with a portion of iron is added
which is common what we call liver of arsenic. Iron has
a strong magnetic power which causes it to be attracted
and thus are generally used to separate it from iron. Now
the particles of iron mixed by striking steel against steel are
owing to particles of the steel iron being the point and raised
the collision or to take fire by their passage thro the air
and sparks were supposed to originate from the iron; but if

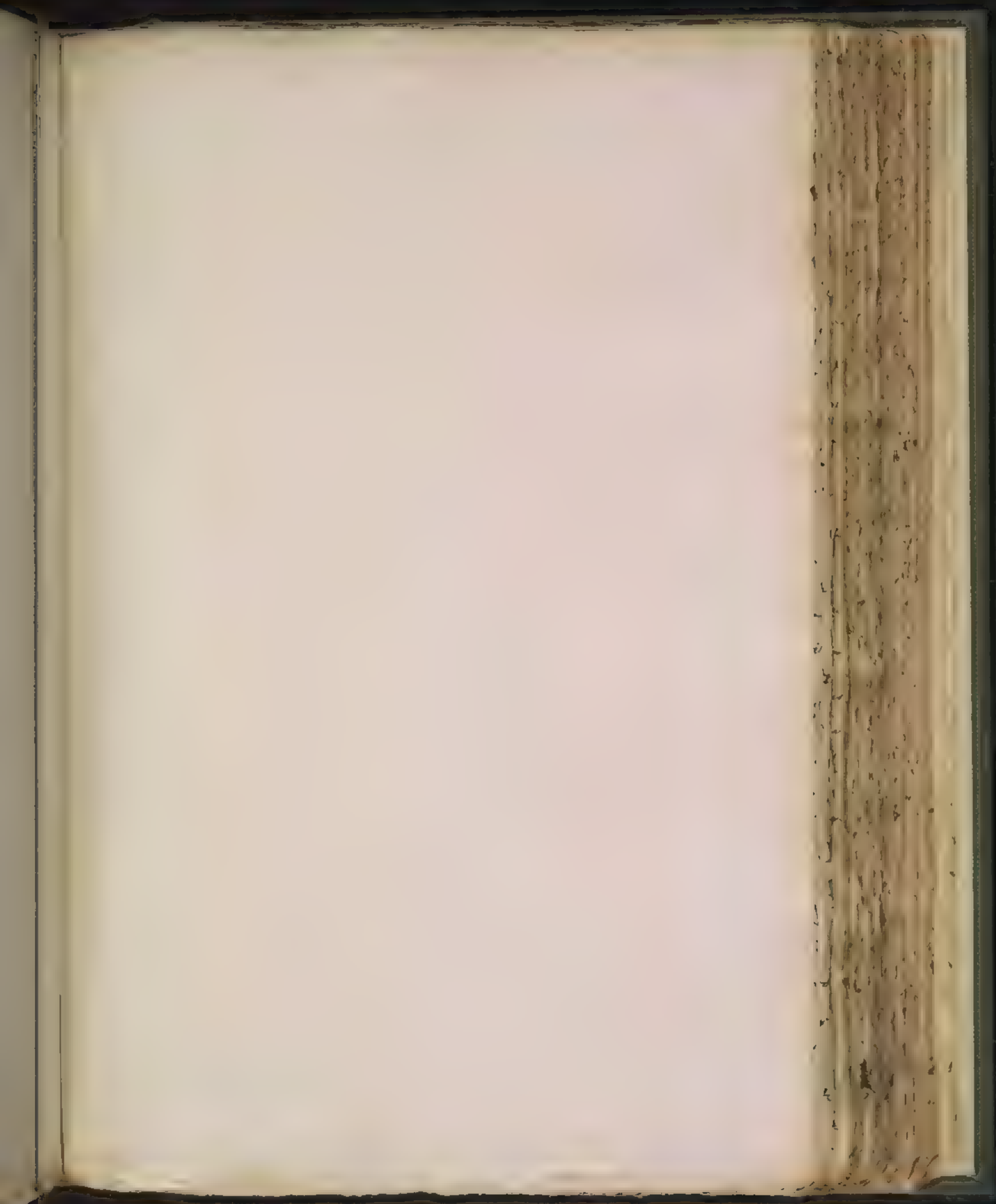


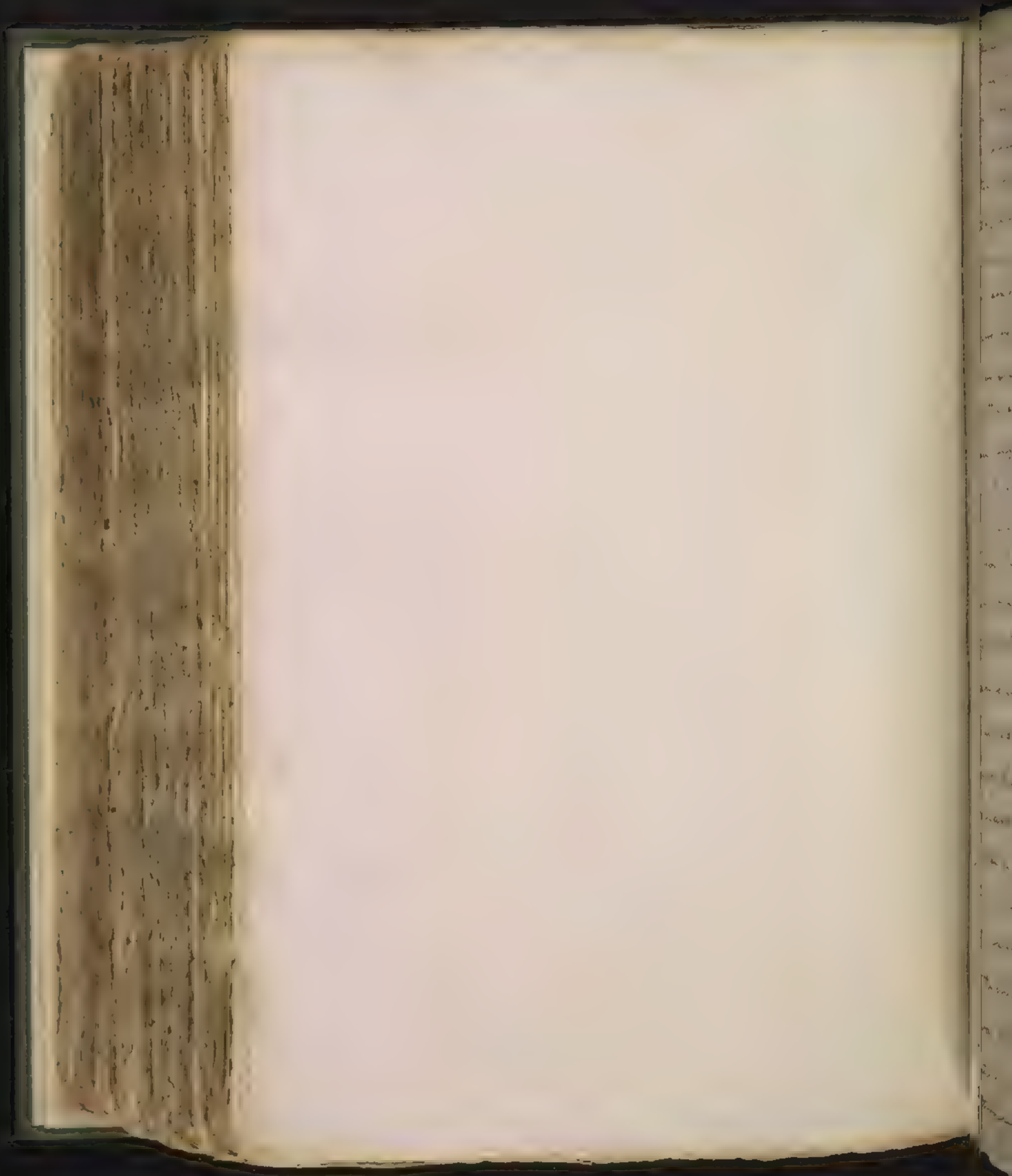
we examine the sparks when received on a piece of paper by a micro-
scope we shall find them to be particles of iron in the form of a bar,
which have undergone Calcination. It has been objected to this
that if two stones are struck together, fire is produced but this is
very untrue, and appears only in the dark & not attended
with heat and will set fire to nothing Iron filings will be
set on fire if thrown into the blaze of a candle: Iron has a strong
attraction to sulphur and unites intimately with it. If a small
quantity of sulphur be added to filings of iron it gives them a
black color. The $\frac{1}{2}$ of the sulphur gradually escapes and its virtue
is combining with the iron forms green vitriol. If equal
quantities of sulphur and iron be mixed and made into a paste
with water they generate heat well and emit fumes which
after some time ~~will~~ take fire and burst forth with
volence if put in a bag and placed underground they
will produce a prodigious explosion tearing and rending
the earth around it. This Phenomenon will give us some
insight into the cause of earthquakes and probably they
are owing to a similar cause. considering how far nature
has led her operations from the view and enquiry of
the Philosophers we cannot expect to arrive at much cer-
tainty on this head. The facts just enumerated may lead
to some useful analogy. We know the bowels of the earth
are where abound with Pyrites, which are composed of
Iron Copper and arsenic united with a portion of earthy
matter and of much fixed air. According to St. Hilaire 100 lbs
of Pyrites contains 35 inches of fixed air. The earth
is covered much with pyrites and there are few spots but
not one moistened with water which either comes from
the



The Ocean is desalted thro Chinks from the surface of the Earth
these facts being granted for they cannot be denied, let us see how
far they will assist us in accounting for Earthquakes



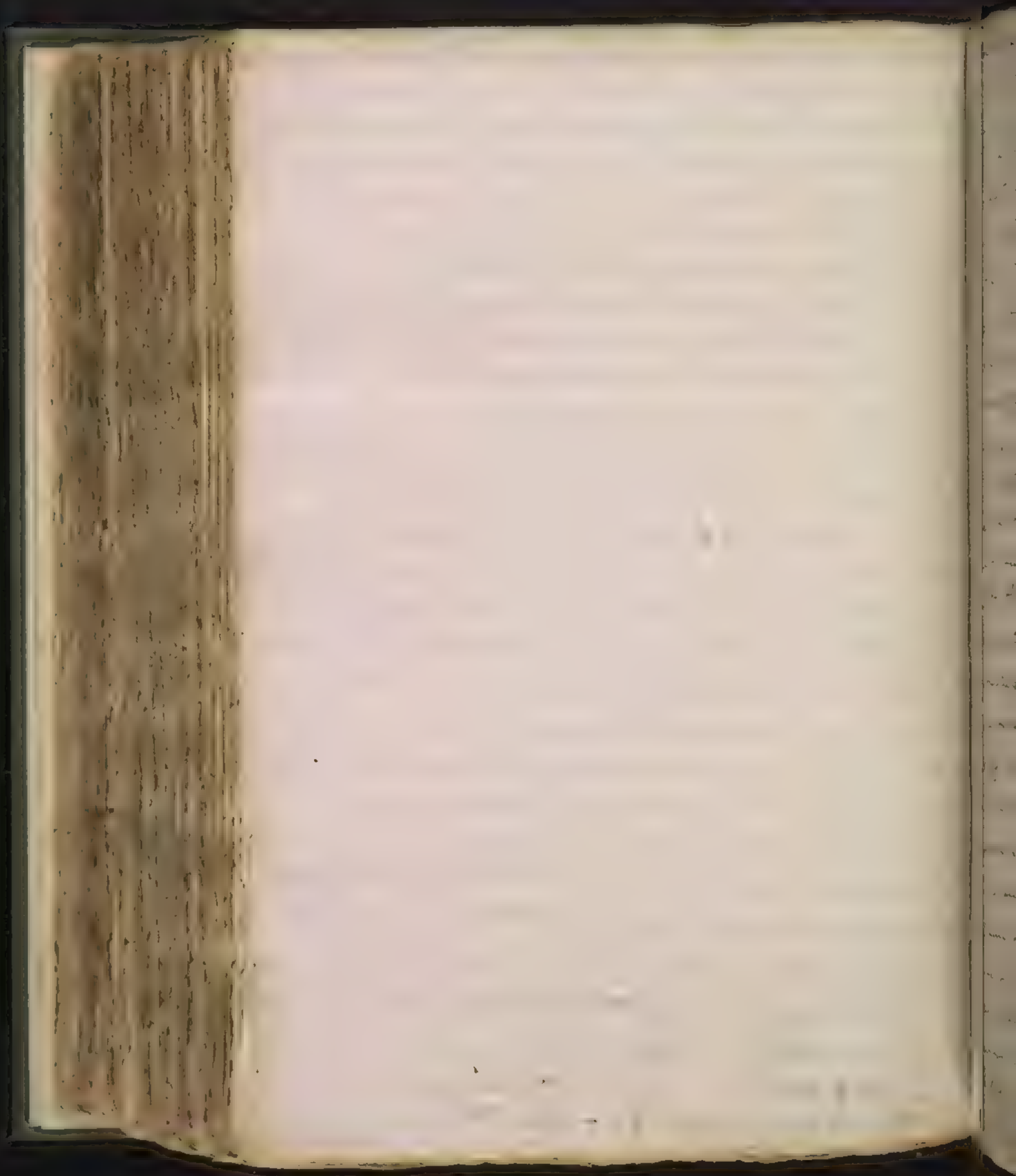




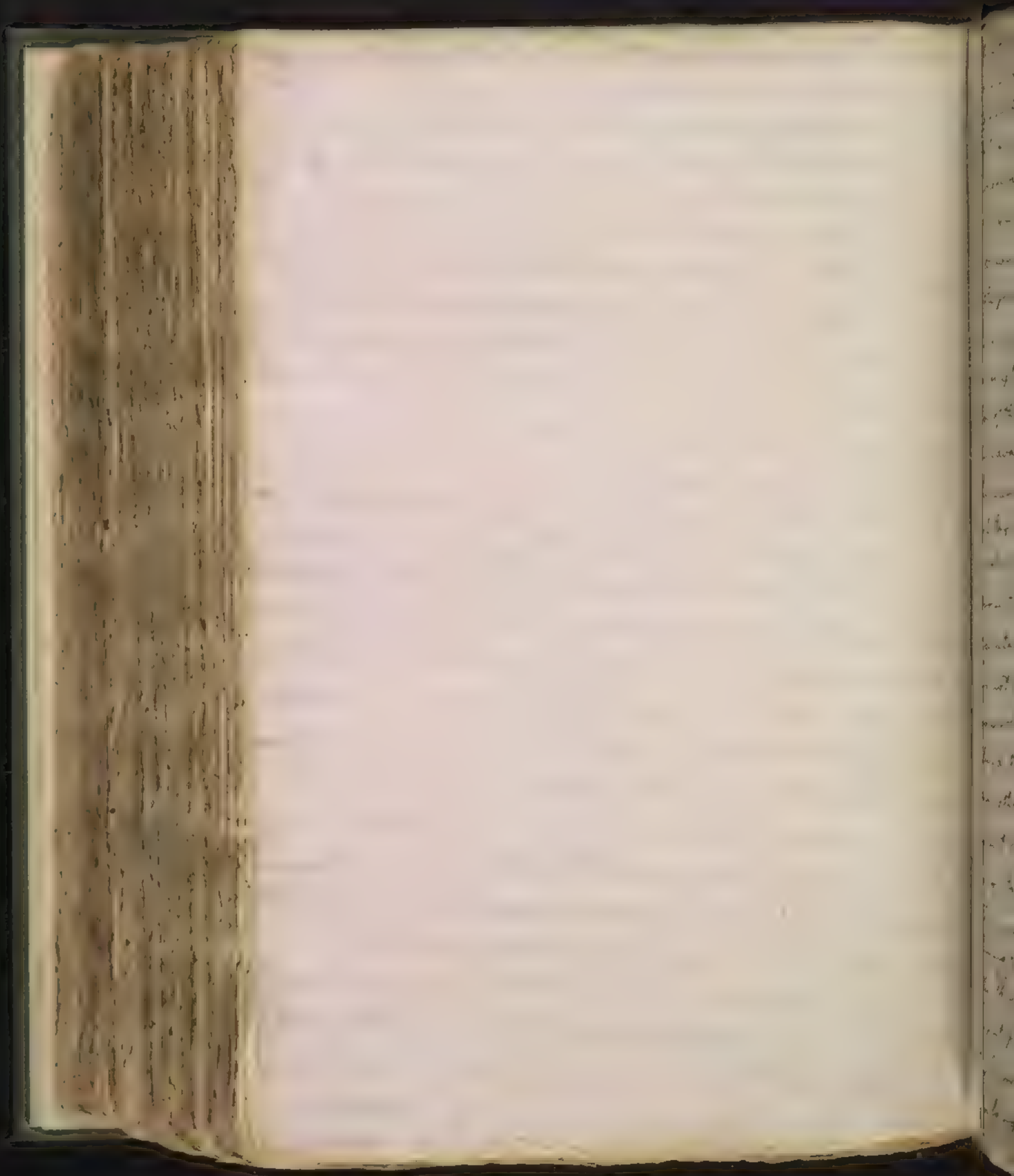
Iron rusts with all the metals except mercury and lead. It is
soluble in water even without being combined with an acid.
The effects on iron is to rust it either by the foreign matters
or the moisture in it: this is owing to the separation of the
iron from the iron. To prevent this Bourgeois recommends a mixture
of Hog's Lard and dressed oil. Dr. Black used to prevent
the rusting of iron superficially by rusting it, inventing
the blue color on the surface prevent the rusting of the other
parts, also by throwing it while red hot into lime water
the calcareous earth adheres to the surface and prevents the
action of the air. Iron has a particular action on a certain
stringent vegetable substances such as Galls Balsam of
Sassafras Bark Folia La V. Many of these are added to a
solution of iron in the vitriolic acid it is precipitated of a
black color. Iron is not the only metal that is precipitated
of a black color Mercury Copper Gold Zinc and Platinum
are all precipitated of a black color by these vegetables. We shall
now make some observations on writing ink. The perfection
of ink is indeed well worthy the attention of the Engravers
by means of this we are made acquainted with the
most remarkable events and interesting anecdotes of the
works of the ingenious and learned men of every age
have been preserved by these means to the great entertain-
ment of mankind. Dr. Linn is not however the color of ink today
is on the union of the iron with the vegetable matter
but he was certainly wrong for the color depends on a
precipitation of the precipitate in the vitriolic acid after it
is thrown down. Dr. Percival of the Royal Society
provided



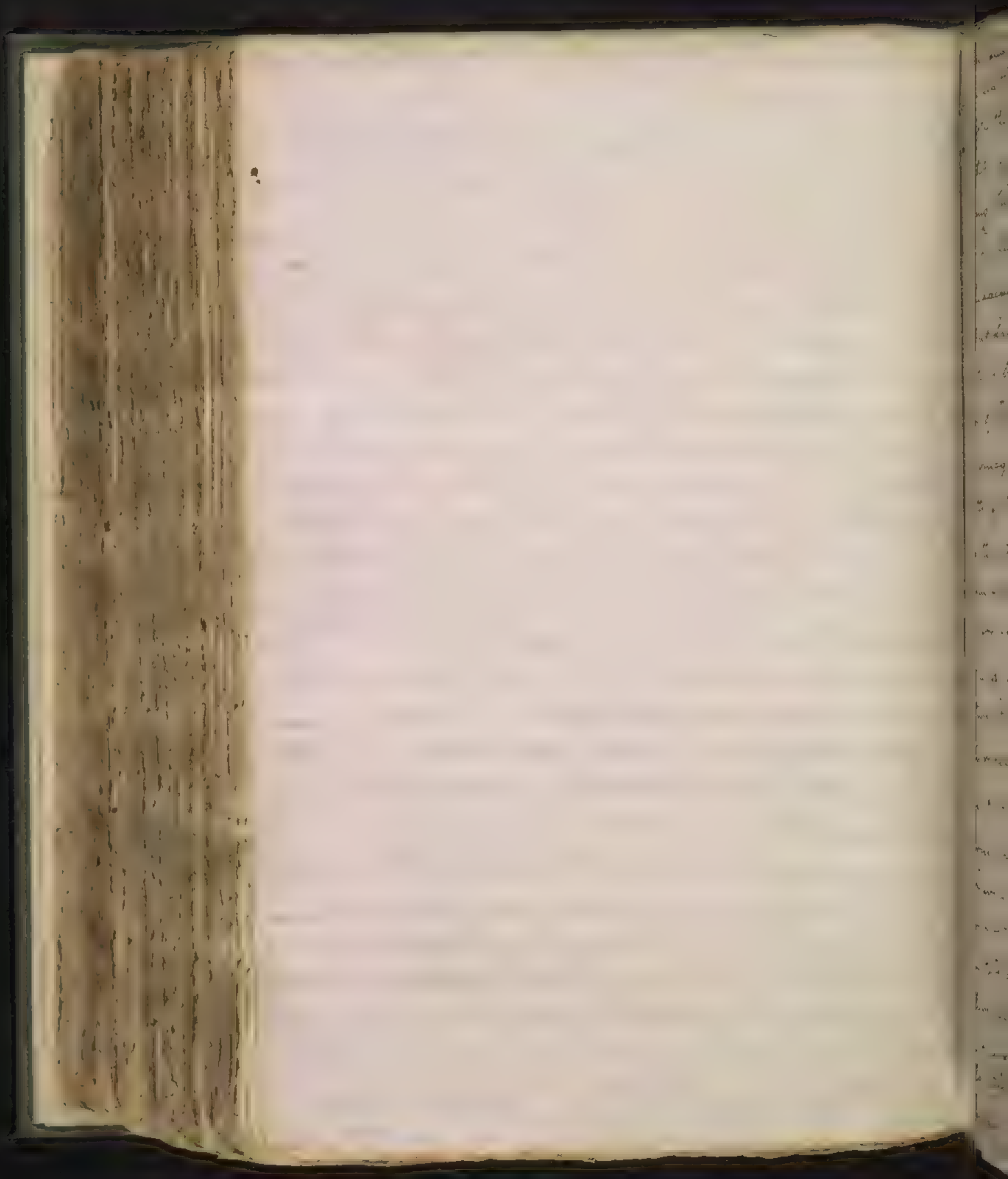
proved this by a simple experiment to a black ink made with
half an ounce of galls and one grain of green vitriol he added
50 or 60 Drops of a solution of fixed alkali, then destroyed the
color by neutralizing the acid and the color was again re-
stored by adding vitriolic acid. Thus we see that ink is com-
posed of more than vitriolic acid and some vegetable matter.
Lichens determine the color of it and whether it be an alkali,
acid or in Decuman of it will now determine it by its power
of turning a green color with various coloring vegetable
infusions which would vegetable, except of striking a black
color with green vitriol is then cooked upon a mark of
its stringency. but this is liable to some exception; thus
one which is a better without stringency strikes a black color
with green vitriol and Gentian which we know to be an
stringent does not produce the least color neither does the
degree of blackness denote the degree of stringency for Sine
which is the most stringency of the vegetables strikes but a
pale black color a proof that this is the degree of blackness is
no measure marks of stringency, and is sometimes apt
to turn pale brown & corruption of the vegetable matter
this may be prevented by adding a little spirit of wine in
which some flowers have been infused. Gum arabic prevents
the color of ink and prevents it from sinking in the paper
and sugar will also have these effects and gives it a
good gloss but it is so sticky that it is difficult to spread
even written with it. The proportions for making the
black ink are as follows 3 grains vitriol and 1/2 oz wood each
one ounce, of galls three ounces of gum arabic an ounce
and half and of rain water 40 ounces. They should after
Mixture



Mixture is exposed for some time to a gentle heat more effect-
ually to dissolve the precipitate of iron and vegetable matter in the
nitric acid. Pale ink becomes blacker on standing, does this
depend on a dissolution of fresh matter or a deposition of the
watery parts have found that pale ink by standing in a weak
solution of iron becomes blacker. The latter therefore is the most probable
supposition. The diminution of the black color of the ink
depend on the destruction of the paper, the imbrication of
the vegetable matter or on being diluted with water. There is
much acid of iron which is not so liable to decay this is prepared
by dissolving or diffusing some coloring matter or charcoal
in water any burnt matter will answer for this
purpose. The Chinese use an ink made of water the dust
of coal of burnt rice and glue. They use a pencil to
write with this ink which sticks on the paper like a pigment
not sinking into it and may at any time be washed off. The
great advantage of our writing ink over this is that it sinks
into the paper and leaves a durable stain which cannot be
washed off. Writing which is done with a sharp pen is more
durable than that done with a soft one as the former pen-
cil penetrates more deeply into the paper. The Romans &
Greeks used an ink somewhat like the Indian ink com-
posed of fine soot and a vegetable gum but they wrote with
a pen as we do. It is of very long duration as to color &c. and
many of the manuscripts written with this are as legible now
as they were immediately after they were written. All
black dyes are thus made viz of green vitriol and the
vegetables



getable astringents. The cloths are first boiled in ostrunged water
infusions and then dipped into a solution of coffees in Water.
De la Harpe proposes to dip paper in infusions of galls before
we write on it, he found that when thus prepared it gave a
much deeper and more permanent color. The same thing
might be done to parchment; this would be of use to Corax
and to write deeds upon and other important records in
which the fading of the ink proves the source of great dis-
putes and injustice in families. The paper should be dyed
before it is glazed, it has been objected that this would spoil
the color of the paper but suppose it should alter it, it would
be no disadvantage for it has been long a complaint
with the learned that we write and print on paper
by much too white for the eyes. it is supposed that the
rottenness of cloth but this is not the case. The cloth is not
rotten from the vitriolic acid of the vitriol for this is
used in greater quantity to give coffee colors to cloths and
they are not more rotten than any other colored cloths.
now why English black cloths are so rotten is because
in England they dye no cloth black that are worth
dyeing any other color. But the French black cloths or they
dye their best cloth black last as well as any other color.
It is common to dye cloth blue before giving them a black
color. All animal substances are tinged by them means.
The blackening of leather is also analogous to this species of
dyeing. The skin has the hair first taken off by lime water
is then put for 6 or 7 months into an infusion of
oak bark, or oak saw dust which is cheaper and more
got in larger quantities. It is coming out every now
and now



and then and throw into other pits which are stronger or weaker
as the leather requires: this by the Tanners is termed Hand
ling. After this it is taken out and scraped clean with a knife
which takes off all the uneven and fleshy parts: this is called
Burrying. Then it is rolled. All these operations are necessary
before it is blackened; then a solution of Spinos is rubbed
over the ~~leather~~ side that was hairy and gives the black
side. But damp black and oil is used when the fleshy
side is to be blackened. The Soal Leather is put into an
infusion of Rye which ferments and thereby becomes or
sour or vinegar. The heat generated by the fermentation
swells the fibres, it is then put into an infusion of oak
bark as the other when it lies for 17 or 18 Months. It is
then taken out shaved and beat with a hammer, it is then
either fit for use or exportation. This is the method used
in Scotland where tanning is carried on in the greatest
perfection. It is very remarkable that animal substance
only receive this dyed cotton and flax will not
receive it from them, it will wash off from them
in warm water. What the reason of this is I can
not tell even from Conjecture. As to the Natural history
of iron we may observe that it is the most useful of
all the metals and hence the most plentifully diffused thro
all nature, there is not a spot on the globe but which con
tains it. It mixes with a thousand substances in which
we could little expect to find it. Most of the Clay Saunders
on the surface of the earth are this red blue and yellow
color



comes to a portion of iron. It is contained in the refined vegetable exudation honey and according to Dr Haller's analysis of the human body in the bones themselves. It is never found pure. It is found first in the state of a Colic sometimes very lugged and sometimes in small round balls. These balls when broken resemble sand they have a small hollow inside in which air is contained on this account if they are laid upon charcoal the air expands and breaks them into a number of pieces. The blood stone belongs to this class whether the Brown the yellow the iron grey or the red, they all contain a portion of iron. There is a Colic of iron found at Naples and other parts of Italy. In the volcanic Puzzolane it is here mixed with a quantity of earth to which it imparts the quality of hardening in water, and it is used to build the foundations of houses near the mouth of rivers the same for walls and towers around the river which and some it becomes the cement or many is nothing but a hard red stone of iron, this is used in grinding glass the iron ore is a Colic of iron the blue marbled earth or lapis Lazuli or native Prussian Blue contain the Colic of iron and the Δ . Secondly iron is found mineralized by Sulphur alone of this kind are the Magnets and many rich ores of iron. Sometimes it is combined with arsenic alone sometimes with Sulphur and arsenic. That ore of iron which is not attracted by the Magnet is not worth working The Method of separating the iron from the matters with which it is combined is by roasting and fluxing. By roasting



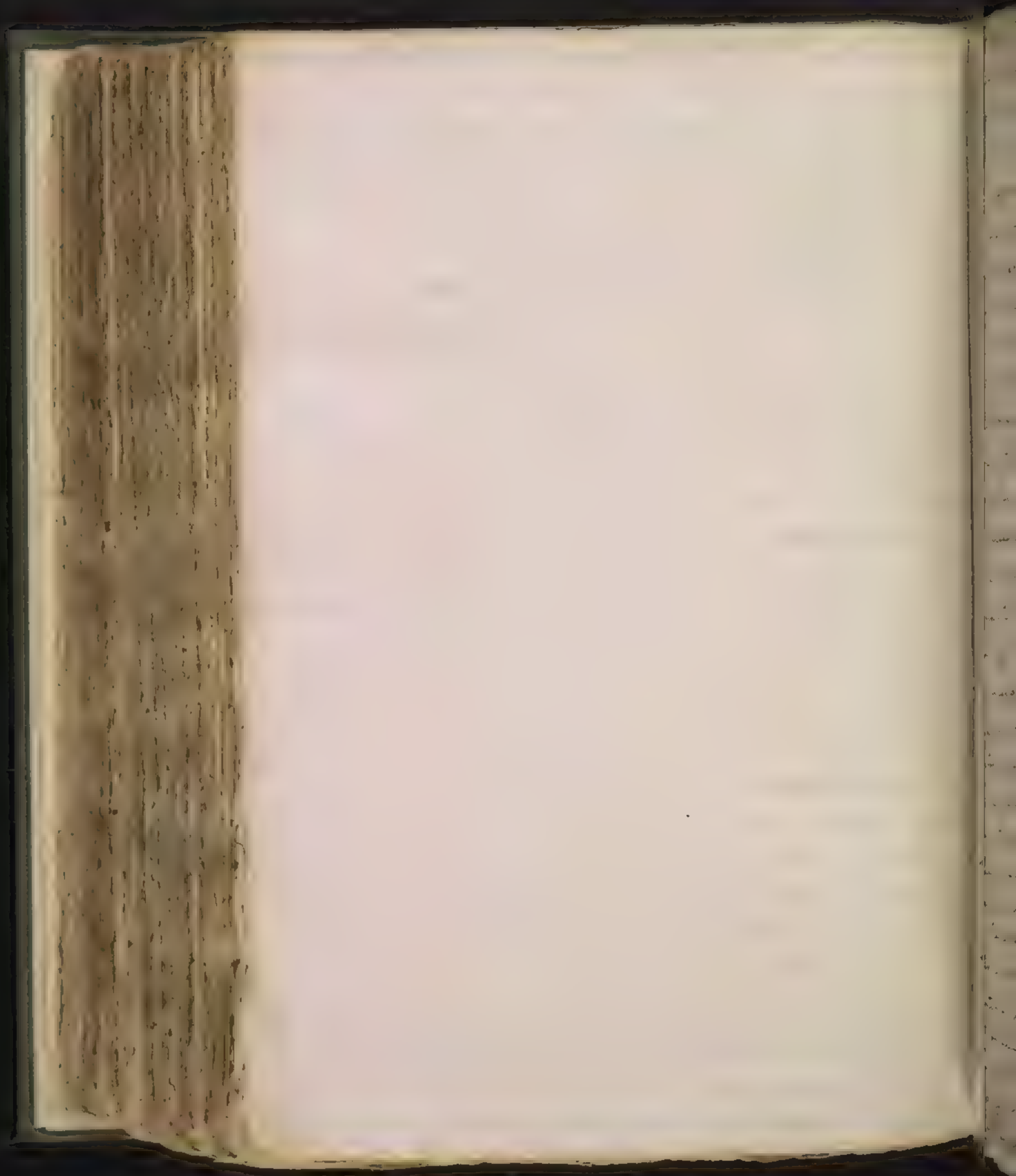
is meant ~~the~~ the exposure of it to a strong fire but not so
great as to melt by this means the volatile parts, ~~as~~ the
arsenic and sulphur are carried off. It is then fluxed with
lime which is the cheapest and best and cast into Mass,
as called pig iron. The metal is now hard and brittle
externally it appears blue and internally white like
dull silver. It is very hard and possesses neither ducti-
bility nor Malleability. It is made malleable by a
second operation called forging. It is then exposed
on charcoal to a strong blast of air which carries off
the ~~impurities~~ and is then subjected to a large hammer which
beats it into bars or Bar Iron which possesses all the
softness and ductility necessary for iron. The Method
of extracting iron from its ore has been long known
Agricola in his treatise de re Metallica describes it in
the most accurate manner.

Copper

This approaches in hardness nearly to iron but has not so much of the δ . It has great Malleability and Ductility. It is of difficult fusibility and requires a strong heat, when fused appears greenish not yellow and is not easily calined owing to its strongly attracting its δ . If a drop of water falls into it when melted it will explode with a loud noise owing to the sudden conversion of the water into vapor by the great heat of the copper, the water carries some of the copper with it hence the dangerous effects of this explosion. Melted Copper throwing in a large quantity of water will not have this effect the water in this case cooling the copper which is incapable of converting a large quantity of water into vapor. Throwing copper into water is sometimes used to convert it into grains this is called granulation of copper. In this state more fit to be united with charcoal and balsam to form Brass copper is most easily calined in a heat a little below fusion copper is more easily affected by all the salts known. All the stronger acids dissolve it while the weaker corrode it. The vitriolic acid when concentrated dissolves it immediately with the assistance of heat it acts upon it with considerable force producing great effervescence and emits fumes of sulphureous smell the compound is of a black color. This black substance is put into water and evaporated small form crystals which are called blue or roman vitriol. The blue vitriol is most commonly obtained for the purposes of arts or medicine from pyrites which are composed of copper with sulphur and earth. There is always a little iron in this composition. The Nitrous acid



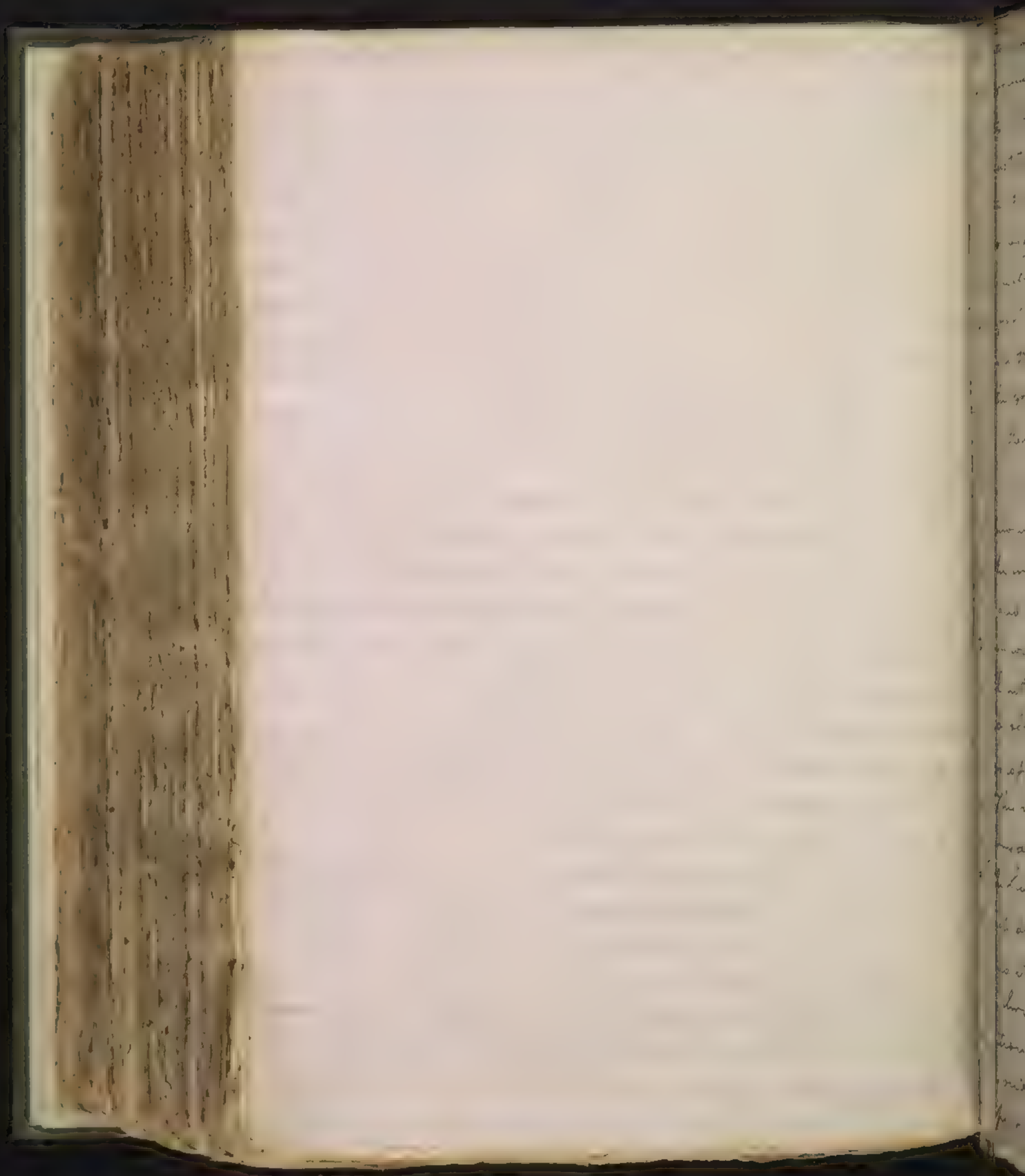
acid acts upon it with effervescence. The muratic acid acts
upon it more slowly, the solution is first brown but afterwards
turns of a beautiful grass green & and deposits part of the copper.
This change of color appears to depend on a gradual
operation of the Δ . It may be intimately united with the
muratic acid by distilling it with Corrosive Sublimation.
The vegetable acids do not act readily on copper with metallic
state the acid upon it chiefly when heated. we find that vegeta-
ble acid may be boiled in copper vessels without hurt if
poured off when boiling but if then allowed to cool in
them they contract a noxious taste and dangerous
quantity. It is owing to the air the contact of which is much
to rusting being kept from the inside of the vessel while
the liquor is boiling but when it cools the steams that fill the
atmosphere the air comes in contact with the copper at
the surface of the liquor which is then immediately dis-
solved. Previous to its being dissolved by a vegetable acid it
must be converted into a carbonate by exposure to the
fumes of Nitrogen and then forms verdigris. It is made
at Montpelier in large quantities. This verdigris may
be dissolved in the vegetable acid and converted into
crystals and is then called dephlegmed verdigris and is much
used by the painters. The acid may be separated from them
by means of heat if they are once or twice distilled and is
highly concentrated and as strong as the fossil acids and
will even produce inflammation with the open heat in the
lungs of the acids besides this except the Nitrous one is sepa-
rated from copper by heat alone the acid may be separated
from



it by alkalies. They precipitate copper from the acids in the form
of a beautiful blue is obtained by adding volatile alkali
to a solution of blue vitriol. The volatile alkali dissolves copper
in its metallic and calced state, the ~~most~~ weakest ro-
tation of copper is sufficient to produce this blue color the heat
with part of a grain will tinge a pint of water. When the
volatile alkali is added to a solution of copper it first becomes
milky and afterwards changes to a deep blue. This color may
be made to disappear by adding some of the same acid that dis-
solved the copper. The vessel must always be open and exposed to the
air or the color disappears. The manner of making this pre-
paration is to take 3/4 of blue vitriol dissolved in warm
water & filter the solution, then add a little volatile alkali
and as much spirit of wine. The solution first becomes milky
and a blue powder then falls to the bottom by which
are beautiful blue crystals. This serves not only to
heat the eye but is used for the epilepsy it does not ro-
tainly succeed as Zinc it is a gentle astringent. The fixed Al-
kali dissolves copper slowly but not so quick as volatile Al-
kali. Water dissolves with it in a strong list of Sal ammon.
is obtained with blue vitriol. We obtain the same with
the Venus, this process is taken from Boyle there is another
preparation with the volatile alkali called Aqua. Lippomana
made by dissolving Sal ammon. in lime water and
allowing them to remain in a Brass mortar for some days
the water becomes of a blue color this must be owing to the
decomposition of the Sal ammon. by means of lime water for
if we put Sal ammon. into a brass mortar around no such effects
are produced. Copper has a strong attraction for the S. It
unites readily with sulphur and dissolves in several of the oro-
metallic oils. Turpentine extracts a green tincture from it. It has
an



an attraction to arsenic which turns it white, hence utensils
made of white metal should be used with caution. The most
remarkable compound of copper is Brass this is formed of Copper &
Zinc. The Zinc tho it is itself white does not so much change the
color of the Copper. Mercury will unite with it with little difficulty
when precipitated from its solutions in acids by other me-
ans. It acts on copper only in its metallic form. The reason
why it acts but when precipitated from acid is that it is more
condensed. Iron is used to precipitate copper from its solutions.
If iron is dipped into a solution of Copper in an acid, the acid
immediately lets go the Copper in a metallic state the copper
attracts the ϕ of the iron. This has laid the foundation
for the supposition of the conversion of iron into Copper.
The iron attracts a blue color and is dissolved by the acid
but there is no transmutation. It is said there is a river
in Germany which converts iron into Copper. It is probable
that this river runs over a bed of Copper Pyrites. The iron
when thrown into it attracts the Copper acid and upon
return the Copper which is reduced to its metallic state by
the ϕ of the iron. It unites with all the Metals all the
imitations of Gold or Brass. Silver &c. and made from
the combination of Zinc and Copper. In some the imita-
tion of silver and beautiful Brass mixed with tin makes
singing Bells Telescopes &c. Copper will unite
with Lead if it is boiling hot. If this mixture is suffered
to cool the Copper is thrown upon the top and is sometimes
mixed with Copper to extract the Silver that it contains.
Copper is found plentifully in all parts of the world or in Swed-
den Hungary Transylvania and America. It is known to
be



be contained in the bowels of the Earth by the blue or green Color
of the ground above it or from the blue or green Color of the Springs
waters. I cannot determine from either of these marks
we must take a lump of the ore supposed to contain it and
roast it with Aqua fortis and then add a volatile alkali
if becomes of a blue Color it is a Copper ore. Copper is sometimes
found in its metallic state but this is seldom the case. It is
found first in the state of a Color combined with Earth
and to this kind belong the gray ore of Copper and like
the green and blue. The 2nd comprehends a great
many other ores of Copper it includes all the ores which
are combined with Sulphur or arsenic to this
kind belong the Copper Pyrites which are distinguished
from the iron Pyrites 1st by their Color which is like
brass and 2nd by the greater hardness of the iron Pyri-
tes which will strike fire with steel whereas the Cop-
per will not on account of their softness. 3rd Head Com-
prehends all those ores which abound with iron or
will or copper and probably contain more iron than
Copper. This metal when found in its metallic state
is not very ductile and becomes more so if combined with
lead. The lead may be separated by chlorification there is
not much danger of the Copper being consumed and if it
is consumed it may easily be recovered. After it is melted Gold
water is thrown upon its surface to cool it, this by its
evaporation produces a great degree of Gold which lies
near the outer surface in the plate. It is now called new
ore Copper. This process is repeated untill the metal
is

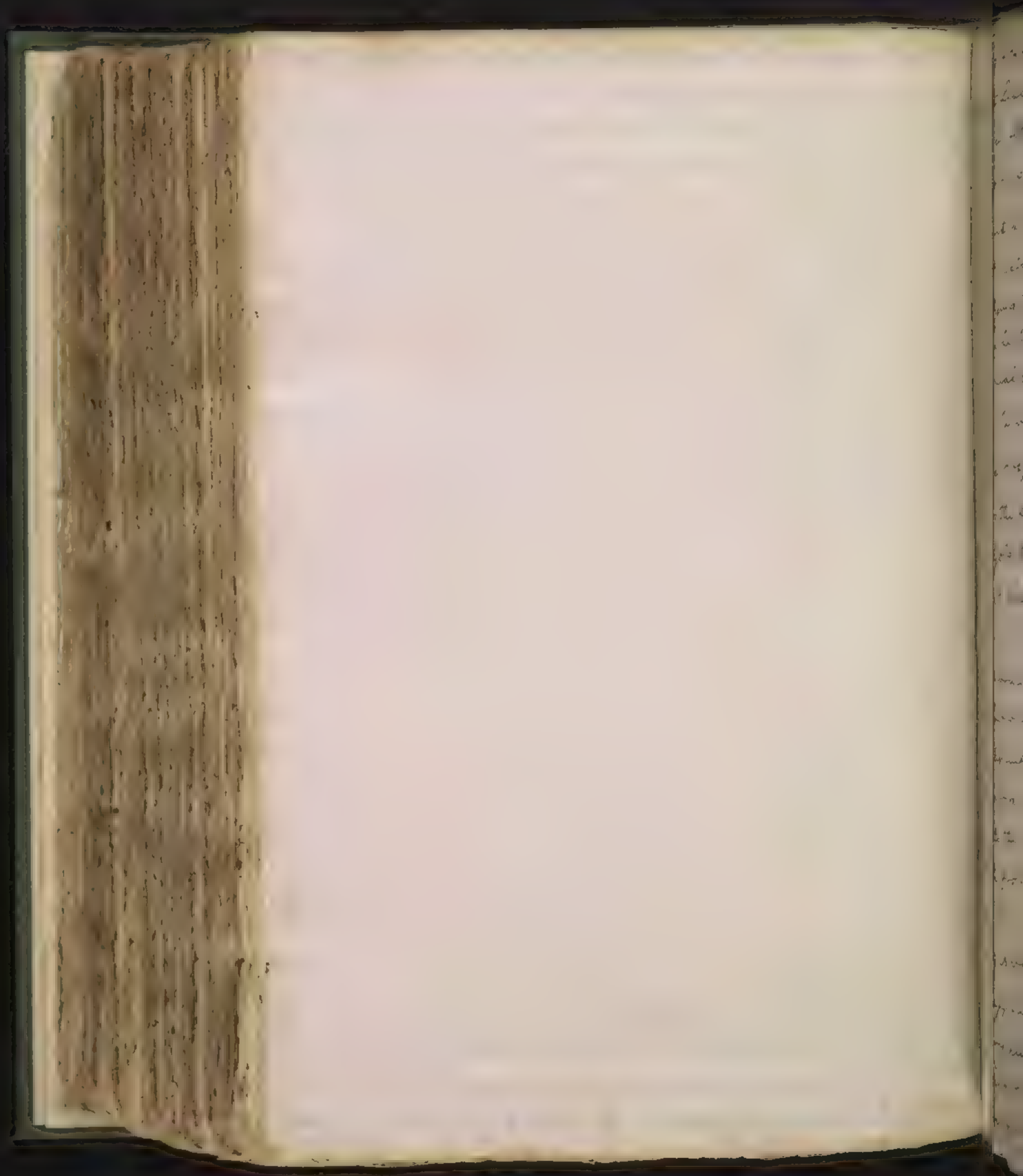


mentally hardened into plates. For a further account of ex-
tracting and preparing Copper consult the aqua. The
man and Commoners Chemistry. I next go on to
speak of the perfect metals but shall first mention
those qualities in which they agree.

Gold and Silver have long been distinguished by the chem-
ists by the name of Noble or Perfect metals. They possess
most of the properties of metals, they are incorruptible
in the air in general and are less acted upon by the com-
mon agents of Chemistry than the other metals. They
resemble one another in their ductility and Malle-
ability which are very great but gold has the greatest
share of these qualities. One grain of Silver may be extended
to a yard in length and afterwards be flattened 2 inches in
breadth. The ductility of Gold is really astonishing, this
is evident in Gold wire the external surface of which
is Gold the internal silver the gold constitutes only $\frac{1}{40}$
of an inch. Gold leaf is only the $\frac{1}{34,500}$ thickness
of an inch. Gold leaf is apt to become of a yellow
color by wearing on this account it is made thicker
that is absolutely necessary. The French Academicians
extended one grain of Gold to the thickness of a line
which is only equal to the 12^{th} part of an inch. Thus we see
the ductility of Gold goes almost beyond conception and
nevertheless strictly true. They are also 2nd indestructible
by fire and endure the most violent heat without change.
Mr Boyle exposed Gold and Silver in a furnace to a most
intense heat and found they were little changed
the



the silver has indeed lost a little of its weight probably from a part
being expressed in vapors. No heat but the concentrated rays of
the sun act on them and then will not vitrify or calcine them
but only cause them to melt & to fuse. They cannot be de-
prived of their Φ like other metals either by heat or air.
3rd They cannot be affected by nitric acid other metals can.
Silver indeed is a little volatilized, this might lead us to
suspect that they do not contain Φ . But we have other proofs
that they do. Acids demonstrate that they do they act on them
as on other metals they act more on silver this is evident
from dissolving silver in the nitrous acid when all the
marks of the Φ take place. There is one fact which seems to
prove that they do not contain the Φ viz. If these metals
are calcined they may be reduced independent of the
addition of any substance, this cannot be denied and
some reduction takes place. This I would suppose to be
owing to the attraction and fusion of the rays of the sun.
The bulk of silver may be reduced by exposure to the rays
of the sun: may not the heat and light of a common
fire act in the same way so as to constitute the Φ . I see
nothing improbable in this supposition. But supposing
these facts do not demonstrate the Φ to be contained in
these metals as all others owe their ductility and Mallea-
bility to this principle and part with it with diffi-
culty in degrees of difficulty we would suppose their
properties in gold and silver to be the same principle and
suppose that they have so strong an attraction to it as to
remove it from substances in which we would not
suppose



supposed it to exist 4th They both withstand the scorifying power
of ~~Lead~~ Lead without loss of lead weight Thus 10% of Silver
may be obtained from 100 lb of Lead without demerit.
Now owing to its strong attraction for the $\frac{1}{2}$ On this
account Lead is used to separate foreign matters from the
perfect metals this is called Coppelation. Lead acts by
scorifying the Copper and separating it from the Silver
with which it is frequently mixed, it is necessary to add
a good deal of lead in this case as the Silver protects the
Copper. The vessel in which this operation is performed is
called a Coppel, it is composed of a soft porous Clay which
absorbs the Lead Lead is used to separate foreign matters
from Gold but it is more difficult to separate them
from it than from Silver.

Silver

An appearance and obvious qualities of silver are suffici-
ently known to us all. It is not liable to rust in ~~the~~ air
unless impregnated ~~with~~ with an acid & is corrupted
by putrid Substances so that float in it. This is owing
whenever to the Copper it contains which it is difficult to
separate from it. Silver melts in a fire heat than
copper. The fire produces no other change upon it. When
cooling it vegetates or sprouts out into branches. This
only happens to large quantities of silver and when
it is very pure. It is owing to the sudden contraction
of the upper crust by which the liquid matter below
is forced out in the form we see it. By pouring
boiling

+++ 8 longhals will be found which are very common
if these are found and so.

boiling and highly concentrated nitric acid and on silver it dissolves
and we obtain a nitrate which serves the purpose of a test
the nitrous acid acts upon it more readily than any other is
diluted with an equal quantity of water it dissolves twice its
weight of silver during the solution some red vapors arise which
are nothing but the NO of the silver. If the silver is pure the solution
is transparent if it contains copper it is blue and when dilu-
ted with water and tested it is found to be better, it stains the
surface hairs made of a red color black & vice. It is used to
give a permanent stain to, however, the substance is to
be kept clean & previously exposed to the sun as the
black color depends on the silver becoming finely divided and thus
being reduced it now requires a dark color in a dark
place. In order to dissolve silver in the nitrous acid it is
necessary to add water to the acid. If this solution is evapor-
ated which is easily be done and poured into little
bowls the silver can be formed. If they are
exposed to the sun with charcoal they will be a great
deal of silver attracts the NO and is reduced to its metallic
state. The nitrous acid is separated completely and this
by means the muriatic acid acts on silver more
strongly and separates it from its solution in the other
acids provided it is free from water. If it contains water
the silver separates immediately and falls to the bottom.
It does not act on silver in its metallic form, it unites
with it best when it is in the state of a case. It does not
act strongly on it when in fumes that is by dis-
tilling it with a common sublimate the best way of
dissolving silver with the muriatic acid is first to dis-
solve



silver it in the nitrous acid and then to add some salt which contains the Muriatic acid. The solution of silver in the Nitrous acid is used to discover the presence of common salts in springs if they contain the least part of Sea Salt they become black on the addition of the solution and the silver and muriatic acid are precipitated. If the compound is dried it melts in a low heat. It is a flexible transparent green substance called Luna Cornea. This when heated emits vapors which penetrate everything but glass. If it is carefully melted and poured into moulds it has many of the properties of glass, but is still much softer than ordinary window glass that has been so thick. Kunkel thinks it possible to make glass insensible to fire in some degree in has been some but is possible that it is only when cooled in this state, this substance should always be kept in a dark or else it acquires a black color. The nitrous acid can be made to dissolve silver when it is in a precipitated state from the nitrous acid in the by means of an alkali. This was discovered by Mr Margraaf. Potash alkali when treated like that which is used for the preparation of Prussian blue dissolves a small quantity of silver. Silver unites with Sulphur and when a black color forms it, it is also dissolved by hyposulphuric acid, it unites with all the flinty earths and with all the metals except nickel, it has the strongest attraction for copper lead and gold, it is unalterable by air and water. Silver may be separated from all foreign matters by means of acid which corrodes those matters and carries them off. It is found in great quantities in South America. We find it 1st in the State of Colima its native State. 2nd mixed with Sulphur alone 3rd with Sulphur and arsenic 4th



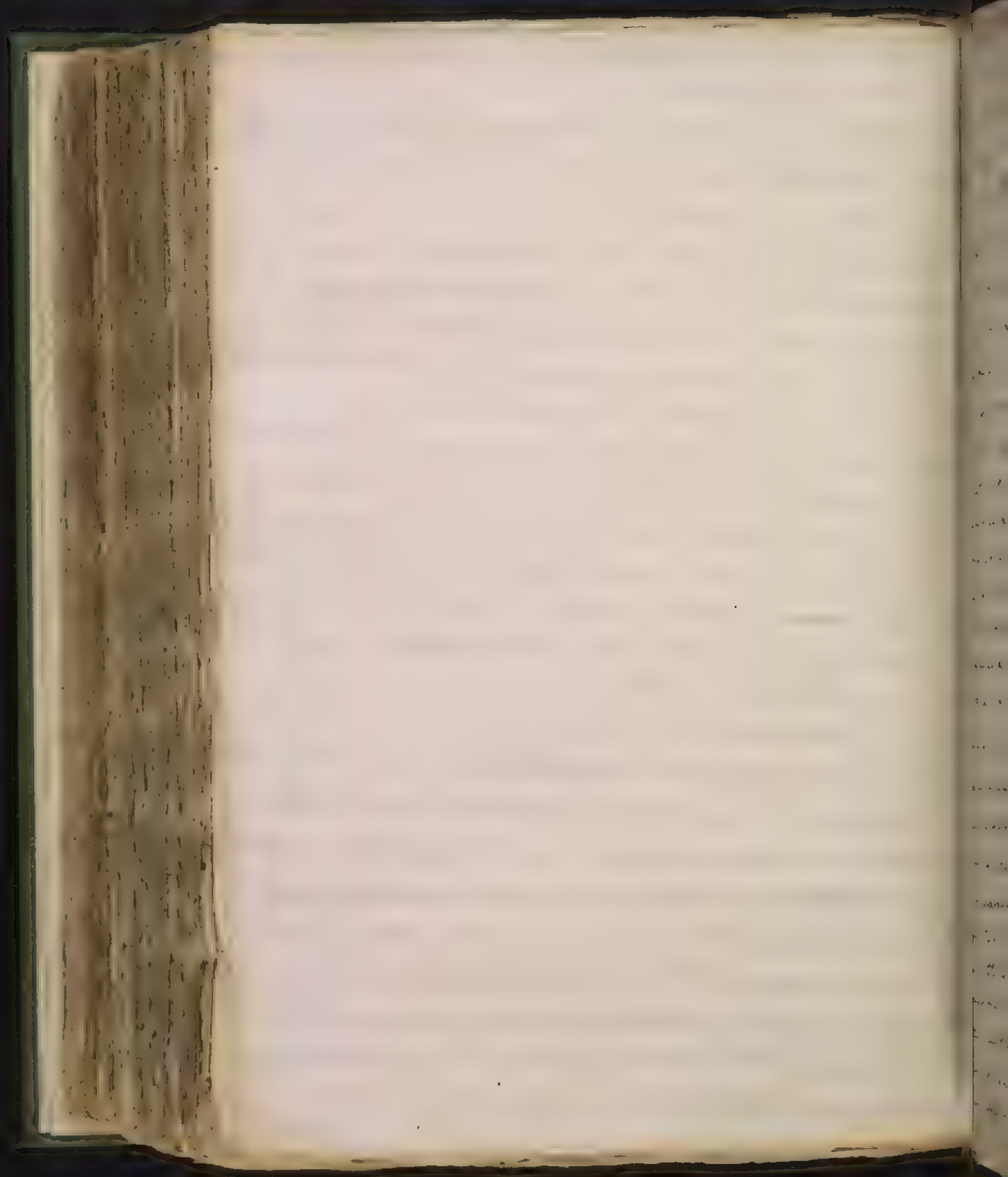
4th with Sulphur & copper and arsenic 5th with Sulphur or
arsenic and iron 6th with Sulphur and antimony 7th
with Sulphur & copper and antimony 8th Sulphur and Zinc
9th with Sulphur and Lead and lastly with Acid of Common
salt.

Gold

When pure is soft makes but little noise when struck and is a
little malleable. its specific gravity is to water as 19 to 1. It expands
in the fire and melts in a white heat. When melted its surface
becomes of a bluish green appearance. It is rendered bright
and purer by the fire. It cannot be calcined by the most intense
heat in its simple state but when in an amalgama with
mercury it may be a little calcined by heat and air, also in
small quantities when combined with tin. Some before
discovered that the fusibility and calcination of metals was
increased by mixture. After it has been fused it always
contracts and loses some of its surface it also becomes more
brittle. Pure Gold is known by the touch Stone. This is a
piece of Whin stone or hard that upon having gold rubbed
upon it, it will tear off some of the metallic particles
and aqua fortis is then put upon the stone. If the metal be
dissolved it is impure if it does not dissolve it is pure
but in this simple state cannot act on Gold. The true solu-
tion for Gold is a mixture of the Nitrous and muriatic
acids called Aqua Regia. The common way of making
this is to mix one part of common salt in 4 parts
of Aqua fortis. There is a better method described by the
chemists this is to put a piece of Gold which has been pre-
viously beaten into a plate into 3 parts of aqua fortis
and



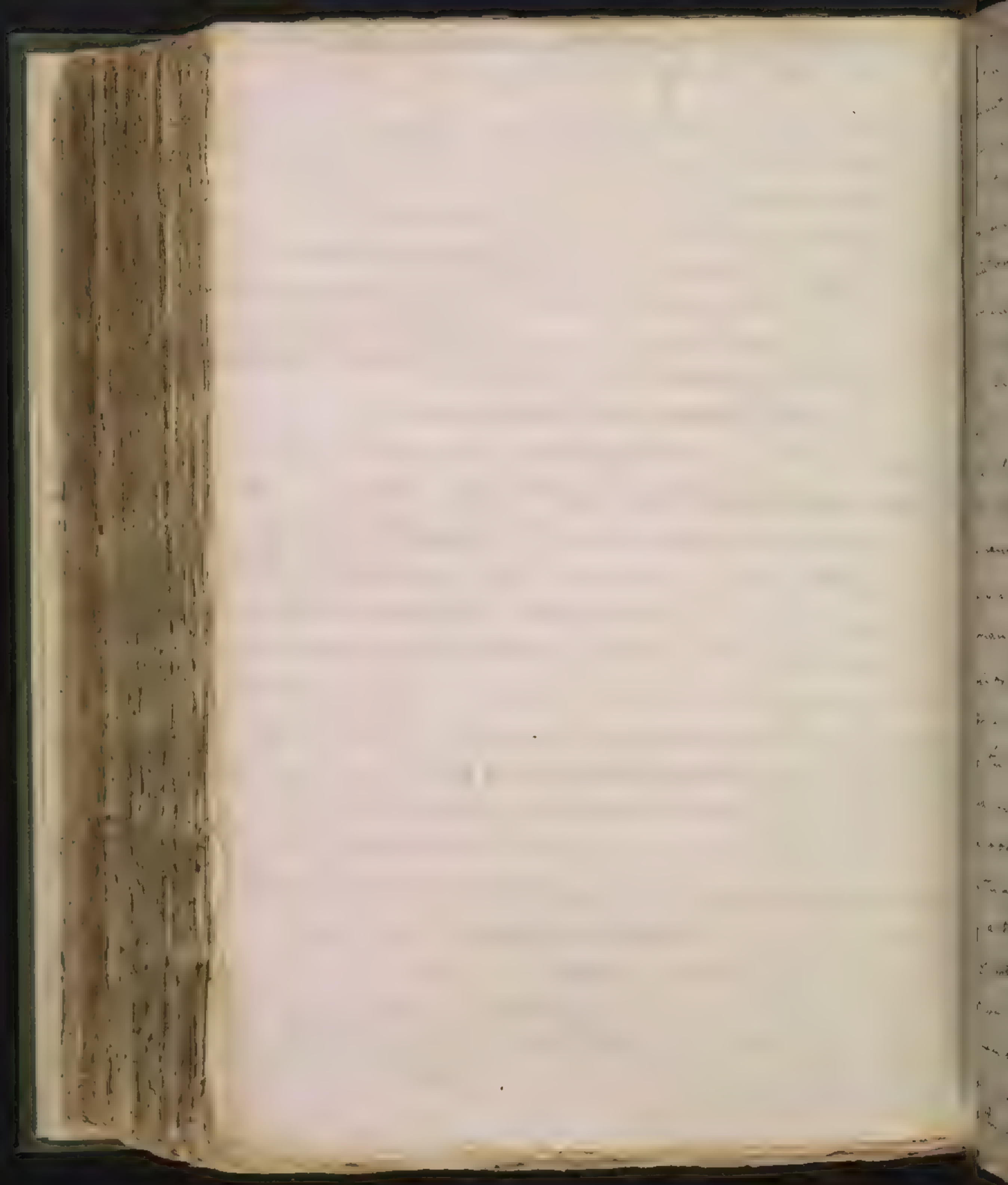
and then to add a quantity of common salt equal to the gold.
In this way the solution is made in a gradual manner,
the nitrous acid acts upon the $\frac{1}{4}$ of the metal and the Murie-
tic acid on the bulk of the gold. The solution is of a bright
yellow color by distillation the nitrous acid may be sepa-
rated from it so that it is only the muriatic acid that
acts upon the gold. Yellow colored crystals may be pre-
cipitated from this solution by evaporation. This solution
dissolves animal substances of a deep purple color it is also used
to give a permanent color to marble which is of a colorous
nature, it penetrates deeply into its substance. It attracts the
light from the light and is thus reduced and to this the deep
color is owing. Gold is separated from aqua regia by evap-
oration, but this always carries off some of the gold with
the aqua regia gold may be precipitated from its solution
in aqua regia by a fixed or volatile alkali. A yellow
powder falls to the bottom forming aurum fulminans
which is heavier than the gold that forms it. If one grain
is exposed to a gentle heat on a ^{piece} of paper, it explodes with
a sharp quick noise like pulvis fulminans. The heat neces-
sary to produce this explosion may be so gentle or not to
damage the paper. Its explosion has been attended with
the most dreadful consequences when the heat has
been produced by friction or the rays of the sun, for
this reason it should always be dried at a distance
from the fire its exploding powers may be destroyed
by washing or boiling it in water, it may also be depriv-
ed



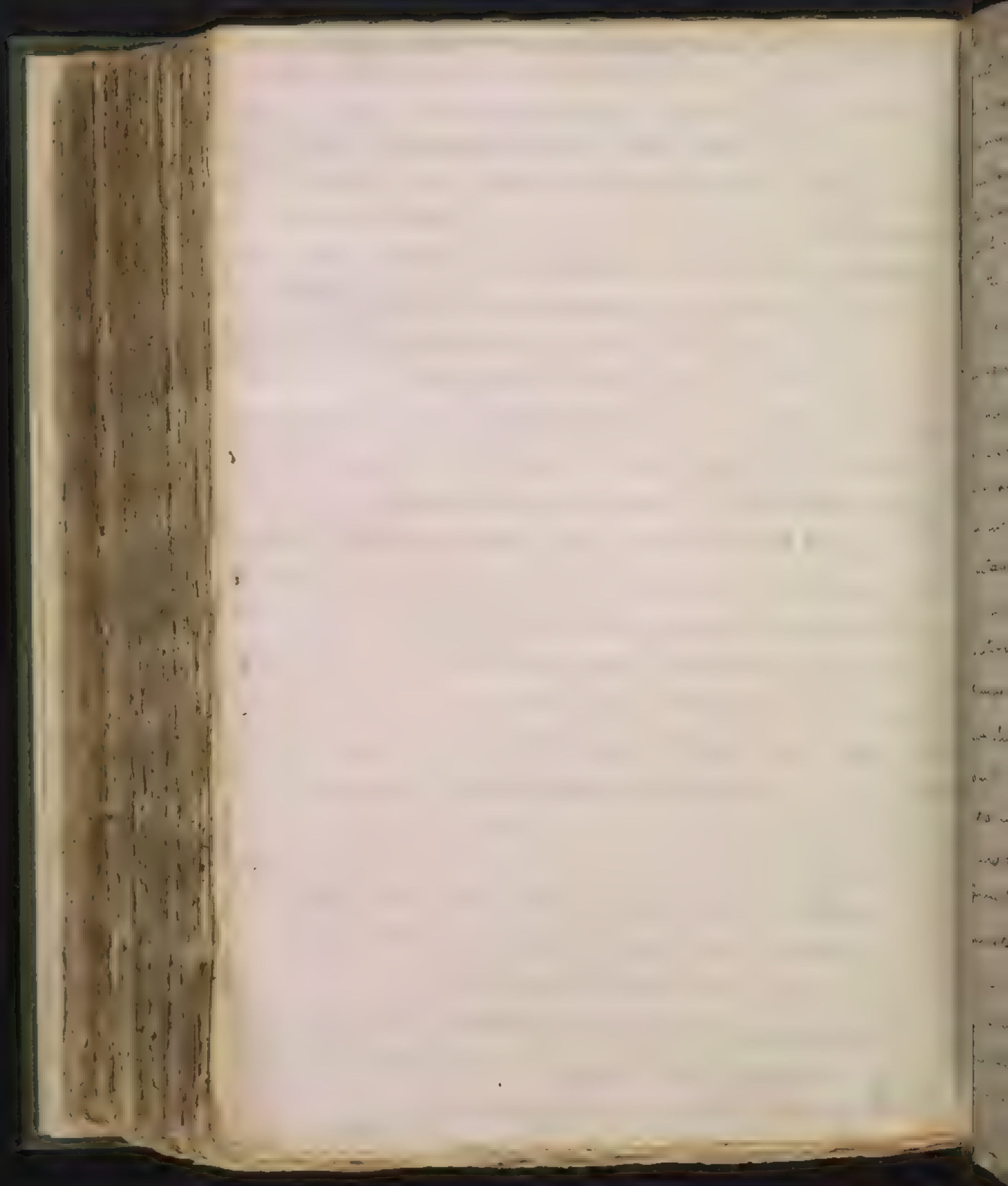
and of its fulminating quality by sulphur fixed acids and the
nitrous acid. The increase of weight and fulminating quality on
in my opinion owing to fixed air which it gets from the other
it may be from its attracting the ~~air~~ from the fixed air and
indeed by setting free the vit. air. The metals use it commonly
employed to separate gold from mercury and lead. Thus they
do by attracting the mercurial acid. When gold has been sepa-
rated from aqua Regia it may be again dissolved by adding
an aetheri prepared in the same manner as that for Prussian
blue. Gold may be separated from aqua regia without
that either dissolves it and reduces it to its metallic state. ~~But~~
whereas it does not dissolve it gold may also be se-
parated from aqua regia by other substances, the solutions
of several of the metals have this effect; green vitriol is
mentioned for this purpose by Lewis which produces
tates the gold of a beautiful deep yellow color which is
much employed by gilders in their Boilers and colored
by gold and suffers no other change than this. It gives a
magnificent color to some; the Ruby color of Porcelain and
glass are produced by a preparation of gold. If the In-
flammable sulphur recovers gold when in the state of
lumen fulminans but does not unite with it. If sul-
phur is added to a solution mixture of gold with silver or any
other metal the sulphur unites with the other metal and
separates, this then is the best way of purifying gold, but
the purpose. And antimony is generally employed in
this the sulphur is combined with the regulus which
renders it much better than when used alone or its vola-
tility is repressed and it endures more heat when it
more



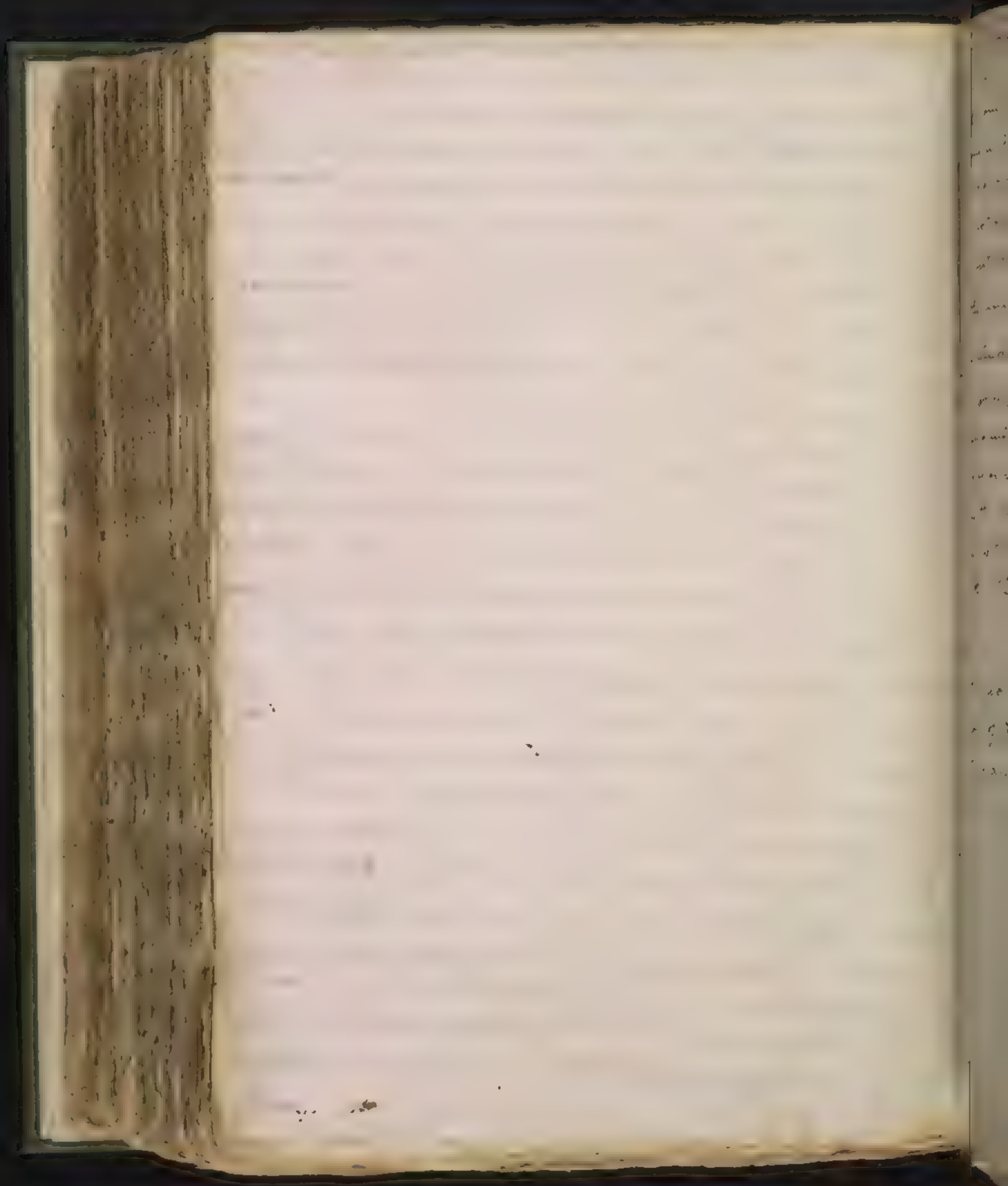
never completely penetrates the metallic matters. When you
mix it with the gold falls to the bottom of the crucible and the
sulphur unites with all the impurities. The regulus may after-
wards be easily separated from the gold by various methods.
Sulphur will not unite with gold. Nitric or Sulphuric
acids will not. This Nitric Sulphuric should be prepared
in equal parts of Sulphur and a fixed alkali and should be used
in a fixed form. Therefore it is very properly supposed that
Moses reduced the Golden calf to powder by means of Nitric
Sulphuric and by this means mixed it with water and gave
it to the children of Israel to drink, what makes this also repro-
bation that the solution when tested is found to be remarkable
better than I thought therefore was a proper punishment
for their Idolatry. Gold unites with all the metals. It is dissolved
and forms an amalgama with mercury. This it is by
means of this that we gild metals. They are first put into a
solution of mercury in aqua fortis and then an amalgama
of mercury and gold is poured over them, they are then heated
till the mercury evaporates, the surface is afterwards burn-
ished and is of a shining appearance like gold itself.
Mercury has a very strong attraction to gold and attracts all
metals to unite with it. The mercury sticks to the gold and
leaves it a white color. Hence gold is used to discover the
presence of mercury in any preparation. If a large
quantity of Mercury is added, the gold is much softened
and penetrated by it and will then crumble to pieces or
mash in your fingers. All metallic substances but Sil-
ver and copper take away the properties of gold. A single
grain of tin is sufficient to render brittle a thousand
grains



grains of gold silver and copper make it harder and are mixed
with it in making coin and in utensils where the hardness is an
important quality. These are called Alloys, there is generally $\frac{1}{2}$
of silver in coin. When gold is pure it is said to be 24 carats
fine, but when it contains $\frac{3}{24}$ lb. of alloy it is said to be 23
carats fine. The operations for refining gold are 4 viz. Blea-
mentation Cupellation, refining with crude anti-
mony and with aqua regia fortis. But the best me-
thod of separating gold is by fusing it with crude anti-
mony, which takes away the Scoriae. Gold is a scarce &
valuable metal it is indeed found in most parts of the
world but in so diffused a state as not to make it worth
collecting. It is found in the greatest quantities
in the Spanish West Indies where 5000 weight of the
ore only contains 12 ounces of pure gold: some is found
in Germany or Hungary in Lead Ore but never in a
separate or pure state. It is found diffused thro the land
in Africa near the Banks of Rivers and near the sea
and on the Banks of some of the Rivers in France as it
Mr Reaumur informs us from whence it is collected
by the poor peasants. Even in Holland it is found
near the Lead mines, but here it is not worth col-
lecting as the Ore does not yield much. Part of the
coin of Holland was formerly made of this gold
but it was when gold bore a higher price than it now
does. There are few veins but what show the presence
of gold, such as are black heavy and contain iron
and the most. The presence of gold may be demon-
strated



tried by roasting with lead and hot air or any other other
lime salt. This method can never be practised to advantage
in the large way. Gold is separated by the same method from
all its ores. When this metal is combined with stony matters
they are pounded and separated from the gold by elutriation
or filtration; there is another method viz by adding mercury
which attracts all the gold and forms an amalgam
with it the mercury may afterwards easily be separated by
heat or elective attraction. From what I have said of the
unchangeable elementary particles of bodies you will
only believe that nothing can be changed into gold
which and mercury never produced gold tho' the ~~the~~
word is supposed by Chemists to be the only active prin-
ciple in metals. It is indeed not possible to produce it from
any metals for as I have said before it does not exist
anywhere which does not exist immediately after
the creation for gold is indestructible in its nature and
tho' it may undergo many forms and combinations yet
it is never changed. Good Men have been sometimes de-
ceived and supposed the hard produced gold when it
presented in the substance they operated upon Bad
Men have deceived others and pretended to the discovery
of a secret & joining in to the methods by which
they have obtained a fortune, you cannot be too public
or decided in declaring your disbelief of the Philosophers
tho' we have now considered the chemical and ele-
mentary history of silver and gold, we shall now say
a few words on them in a political view. I am a Quaker
never

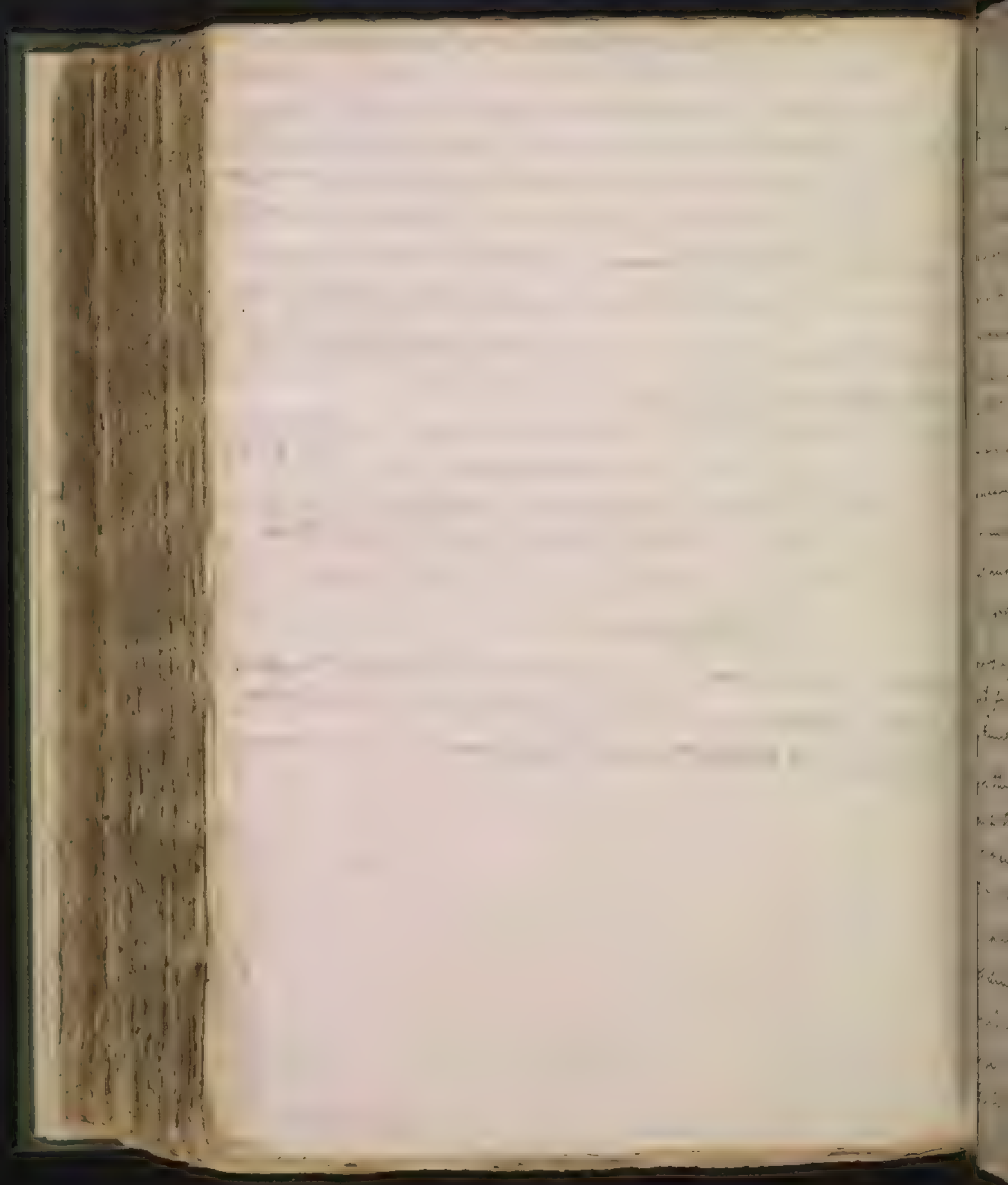


mint coined in England they have depreciated 200 times in
value this is owing to the plentiful diffusion of gold over all the
world and the present great quantity of it The Abbe Renaud
informs us that 20,000,000 are annually sent to the East
Indies from Europe where great hoards of it are buried, for
he is not accounted the richest man who shows most Mo-
ney but he who has Europe's most. Providence seems
by this unaccountable foolishness in the Indians to
have intended to prevent the great quantity of it viz
of the gold from lessening its value too much. This
also accounts for the vast quantities of gold which are
made of or sometimes accidentally found in the East
Indies, the inhabitants often dying without having
revealed to their successors where they had hid their
wealth. There is another perfect metal called

Platina

If then you have a very accurate account in Lewis
Gordon of Newman's Chemistry to which I add
nothing and to this therefore I refer you —————

Having



Having now finished the Consideration of the Waters we are next to
treat of

Waters

All the general properties of water such as those we ought to consider
of their elements and the like which Dr. Boerhaave has said is
much of it belongs properly to mechanics and natural Philosophy
we therefore shall not touch upon them. Water is a mixed body
and as such comes improperly under our consideration. Water is
never found pure entirely the I have no doubt but what
there is elementary water there is no water presented to us
natured but what is mixed with some foreign matter and some
of these are so intimately mixed with it that there are not
easily separated Mr Boyle first taught us that the purest
water may be converted into acid by distillation. The same
experiment has ~~been~~ since been repeated by Mr Whargrout
and Mr Godfrey says that the same effect will be produced
by simply agitating water in a Phial for a length of time
near the formed and of the angustulous bellarious and
fluffy kind. This will account for the emergence of the
banks of the Sea and for Islands appearing in place
in which they were never seen before viz by the accretion
of earth by the water. Islands grow or are increased
on those parts that are exposed to the winds
and suppose from this that water is in a continual
state of diminution and that it will continue to
diminish untill the general conflagration they
suppose we cannot otherwise understand how
the Catastrophe can take place, but this seems to
be

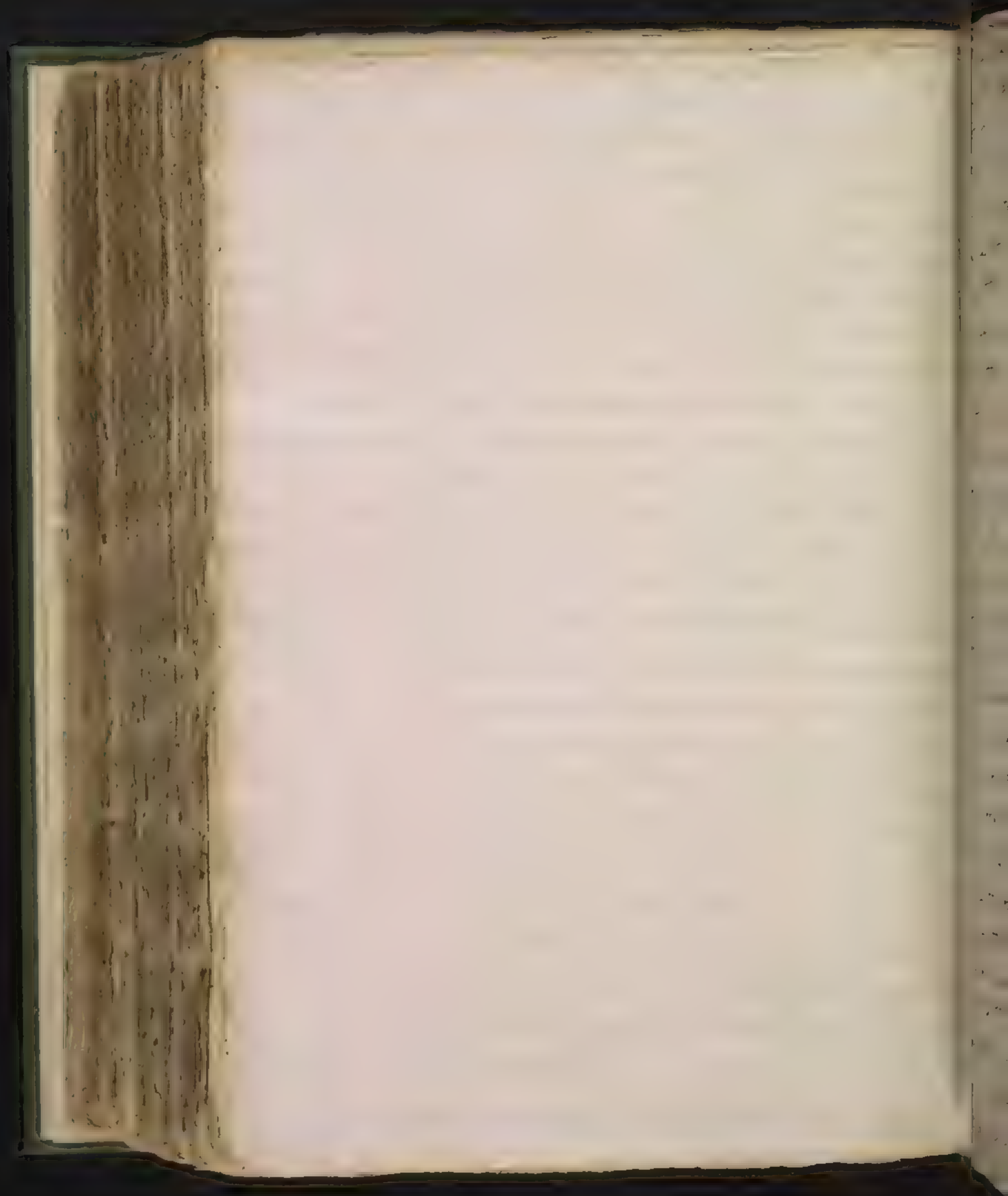


believing we much ~~more~~ ^{less} aptly to find causes
of the fire is contented or to melt the hardest rocks the water
can have but little influence in stopping its effects I am for
from thinking that the water suffers any diminution on this
account; there is a perpetual reproduction of it from the
decomposition of animal and vegetable substances, tho' this
water may not appear in the place from which it was abstrac-
ted yet it certainly does appear in others. I do not suppose that
a single particle has been created or lost since the creation. I
do not suppose that actual transmutation takes place
or that the quantity of the water is diminished but I ima-
gine the Earth existed in them before and that it is only
separated by distillation or agitation.

All Waters may be divided into Mineral and Simple.
The Simple have been divided by the Chemists into differ-
ent Genera and Species as if each Genus and Species possessed
distinct properties but these waters differ only as they are
more or less pure, they are in other respects always the same.
Of the simple are Dew Rain Snow Hail (these are called
Celestial waters) Ponds Lakes, Rivers Springs fountains and
Well water these are called Terrestrial waters. The Cele-
stial waters differ according to the place over which they
fall, they are more pure when collected in the Country -
than in the City. Waters differ also in purity according to the
season of the year, thus river water is always more impure
in the Autumn than in the Spring. These impurities are al-
ways either of a vegetable or animal nature, if this water
is confined it undergoes a fermentation and becomes
pure

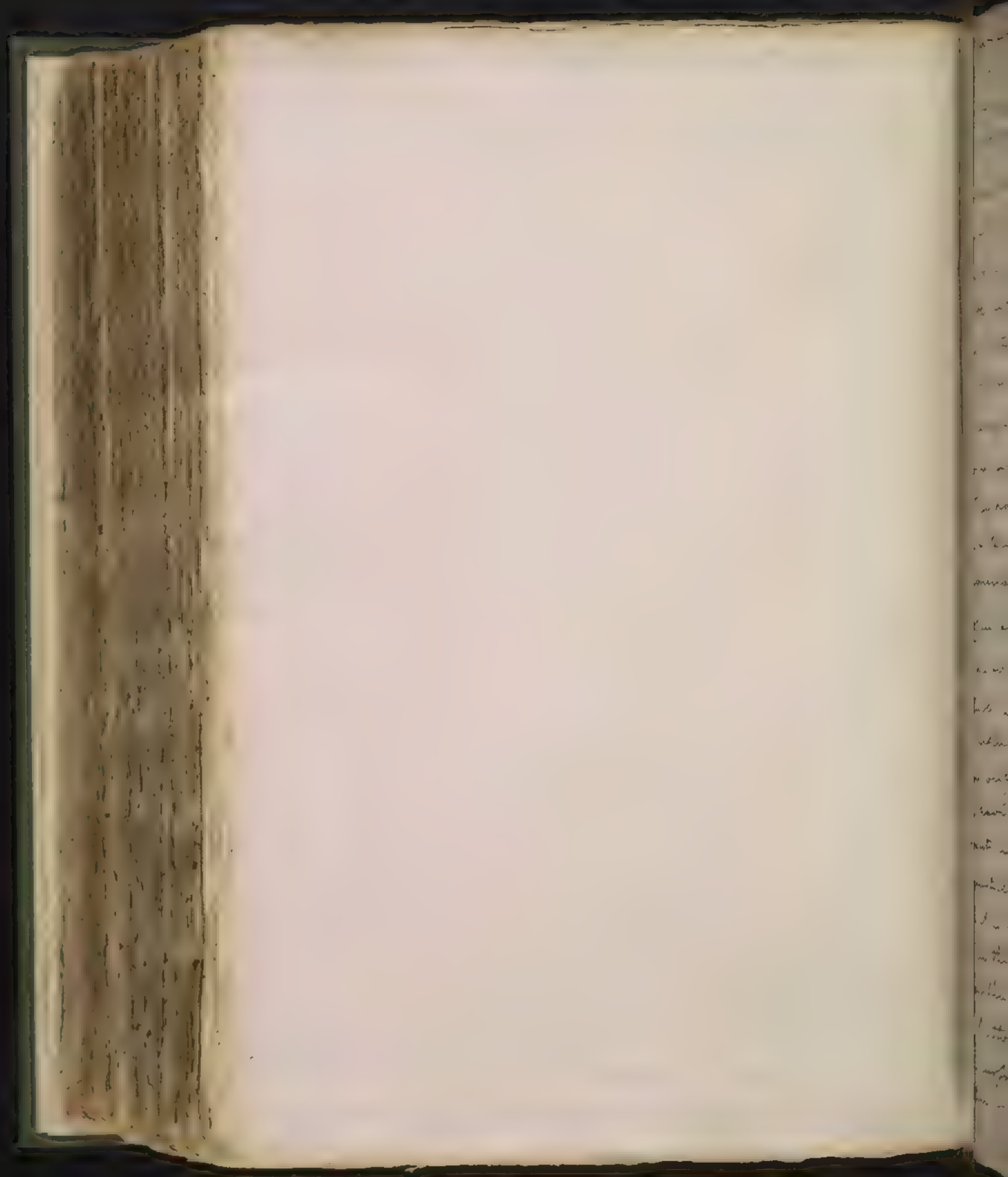


pure transparent and is infatigable and modern no. There are two Phenomena in simple water which we shall explain. There appears in water in the spring and summer showers a matter which has been supposed to be felt but from its color. It is nothing but the Pollen or farina fecundans of plants which has been carried up by whirlwinds. They are insoluble in water and stand infatigable in the fire, every particle is a distinct organized substance and contains a perfect plant in embryo. There is another Phenomenon in Water viz. an appearance of blood. This is owing to a vast number of animalcules of a red color in the water. This has often alarmed Villages and Countries who have considered it as a presage of some terrible event Mr Walter tells us that in Lord Anson's voyage round the world he found a place in the Pacific Ocean on the East Side of South America where the Water appeared of a deep red color. On examination they found it to be owing to an immense quantity of spawn, upon taking up some of it in a glass and suffering it to stand a while it became transparent, there were only some various red globules swimming in it. The Red Sea owes its color to sand. The Banks and sides are covered by red sand which by agitation is diffused thro' the water so as to give it an uniform red color for by taking up some of the water in a glass some the sand subsides and leaves the Water clear and transparent. We are now to treat of Mineral Waters. This is a very different subject & there is no part of Chemistry more obscure than that relating to it. The discoveries which have been already made on this subject show us how absurd our former opinions



... were and how cautious we ought to be in admitting
principles the founded on demonstration. The substances
most commonly found in mineral waters are as follows in
the following We shall first mention the sensible qualities of each
water and then mention the fact which tend to confirm
us as to the presence of different matters. The first mentioned
here is the Nitrolic acid this is the only one of the acid salts
that is found in Mineral Waters. It discovers the presence
of this by the taste which is sour 1st by its striking a red color
with the syrup of violet. 3rd by its effervescing with a solution
of the water becoming turbid upon the addition of a
solution of lead in the Nitrous acid. In this case the vit.
acid unites with the lead for which it has a greater affinity
than the nitrous acid and falls to the bottom
the nitrolic acid may arise from the water running
over Pyrites.

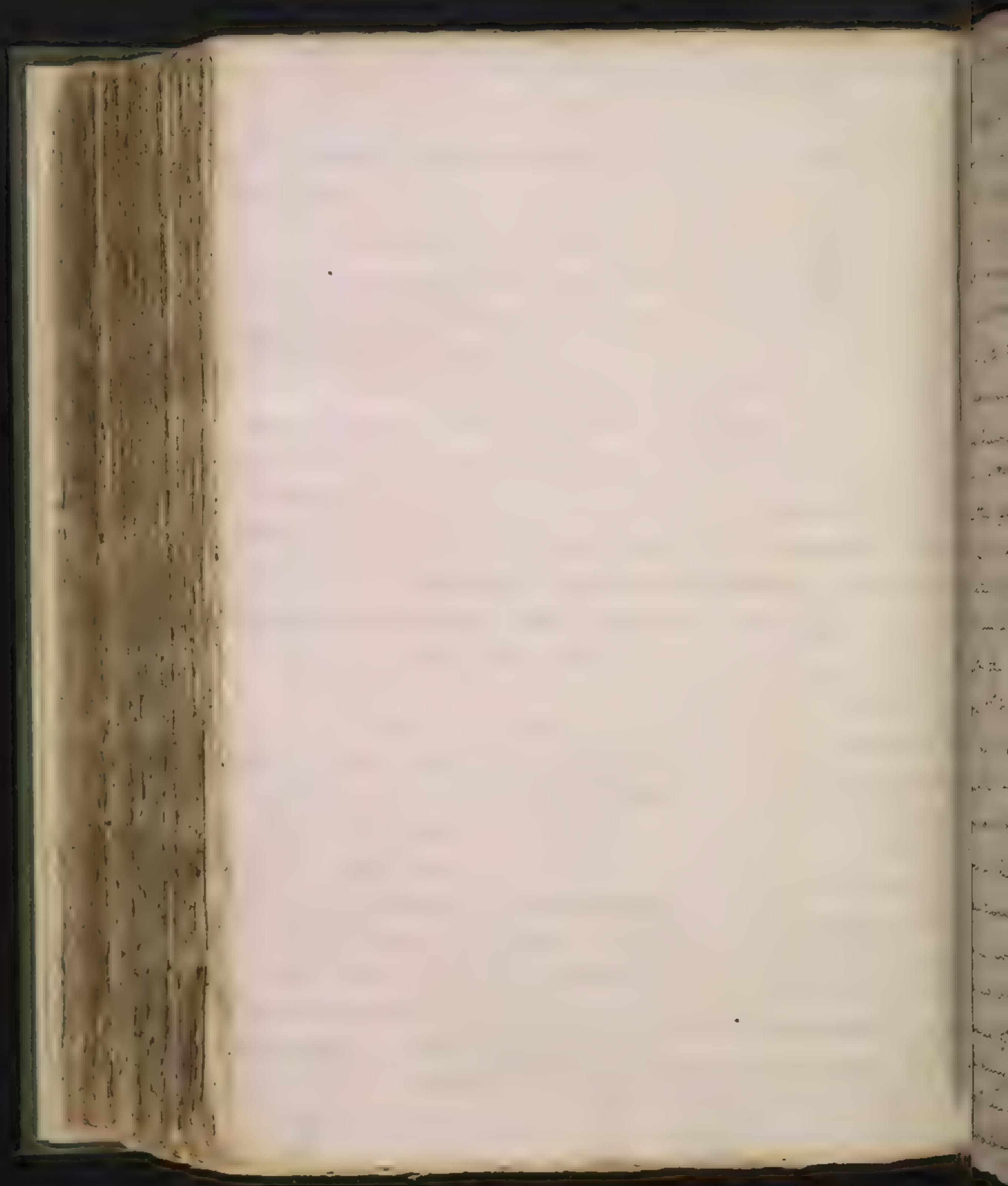
in the Alkalies The Sodic is most commonly found in
Mineral waters. The vegetable is sometimes found in Water
but this is only when it has flowed near a bed of putrid vegeta-
ble matter. The Sodic alkali is seldom found pure in
water, it is generally combined with carbonate, so that
in the Earth of magnesia, these are held in solution by
means of the fixed air afforded by the alkali. It presence
may be known by its imparting a green color to the syrup
of violet. 2nd by effervescing with acids. 3rd by decompos-
ing the sal ammoniacum fixum 4th If a solution of
corrosive sublimate is added the mercury will be pre-
cipitated of an orange color 5th If the vitriol is added



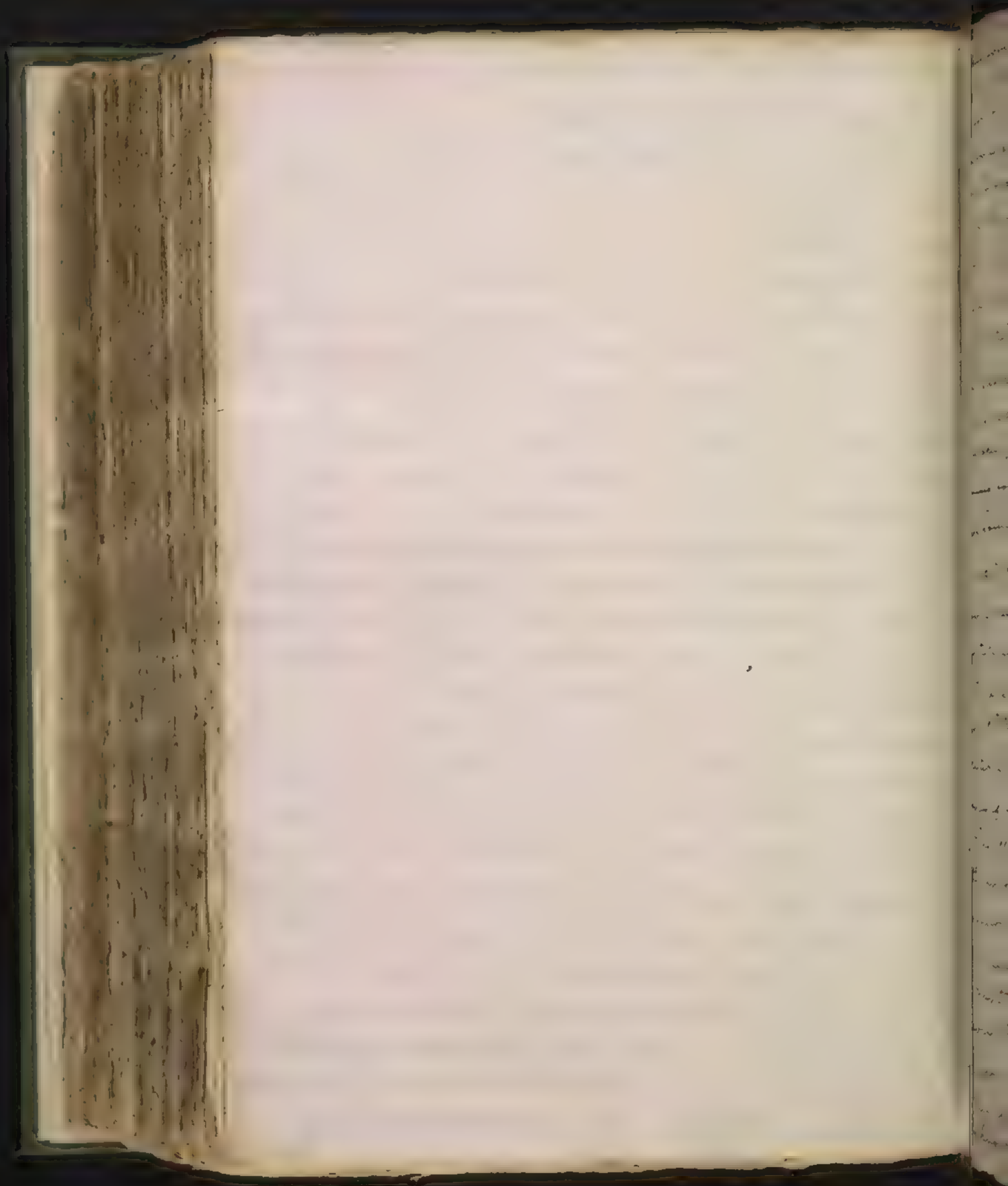
The copper will be precipitated of a green color.

The presence of calcareous earth has been proved by Mr. Overmire. Water may dissolve calcareous earth when the fixed air of the soil is exhausted but Mr. Overmire has also taught us that it may be again by communicating a greater quantity of air, natural to it. Hence it is generally found combined with alkaline waters from which they acquire their fixed air and which perhaps has been extracted from the alkalis by effervescence. It may be detected first in the case of the Water which is white and of a flat insipid taste and by becoming turbid and white and forming a coagulum upon being precipitated ~~from~~ ^{by} an alkali. 3^d by adding a solution of corrosive sublimate the mercury is precipitated of a brown color. 4th by adding tincture and if it contains a few calcareous earth or selenites will be formed and if it contains the earth of Magnesia an Epsom salt will be formed if the earth is of an argillaceous kind an alum will be formed. The last is an evaporation of the water & crystalline earth is insoluble in water.

Of the inflammable bodies Sulphur and Oil are found only and it is in compliance with custom merely that I have not sulphur in the yellow but I do not believe it ever exists in them or it is insoluble in water and not the least particle of Sulphur can be obtained from these Waters in which it is said to exist. What has been mistaken for Sulphur by the smell is nothing but the fumes of Oil. Of the fossil oil Naptha is found at the Bottom of Ponds which have black Bottoms, but of this I spoke before. Petroleum floats on the surface of mineral waters when it is inflammable. When these oils unite with the water it is thus the intervention



an alkali forming Soap. It is then known by a bituminous taste
a white or yellow color and by forming a Lather when agitated.
The Metals Iron and Copper and the only ones found in mineral
waters. I am well aware that Lime is said to have been found
in water but I do not believe it. It has been truly discovered that
Iron is soluble in water in its metallic state, but considering
that it was long known that Iron was dissolved or rusted when
exposed to the air and that their compound in which it was
supposed to be united with the Nitrogen and never fixed at
alkali flowing with them it seems surprising that we
should have been ignorant of so long. Its solubility is con-
firmed by the intervention of fixed air or appears from a letter
to me from Mr Lane an apothecary in London to the
Honorable Mr Dovendish. The fixed air that holds it in solution
is generated by alkalis and calcareous Earths and is not loos-
ened from them by an acid. The iron when remains suspended
and after the water is exposed to the air & calybrate Water one
known 1st by striking a black color with an infusion of
galls then and some facts which show that iron is soluble
in simple water without fixed air. This may be proved
by a simple experiment, if water stands on iron filings it
acquires a calybrate taste and will strike a black color on
the addition of an infusion of galls. From this it is evident
that iron in water need not be supposed to find it in ani-
mal and vegetable substances, it is conveyed into them
by means of the water which carries their nourishment.
The striking a black color with astringent vegetables is
the most universal and infallible test. There are few Mineral
waters in this country but what contain iron
this

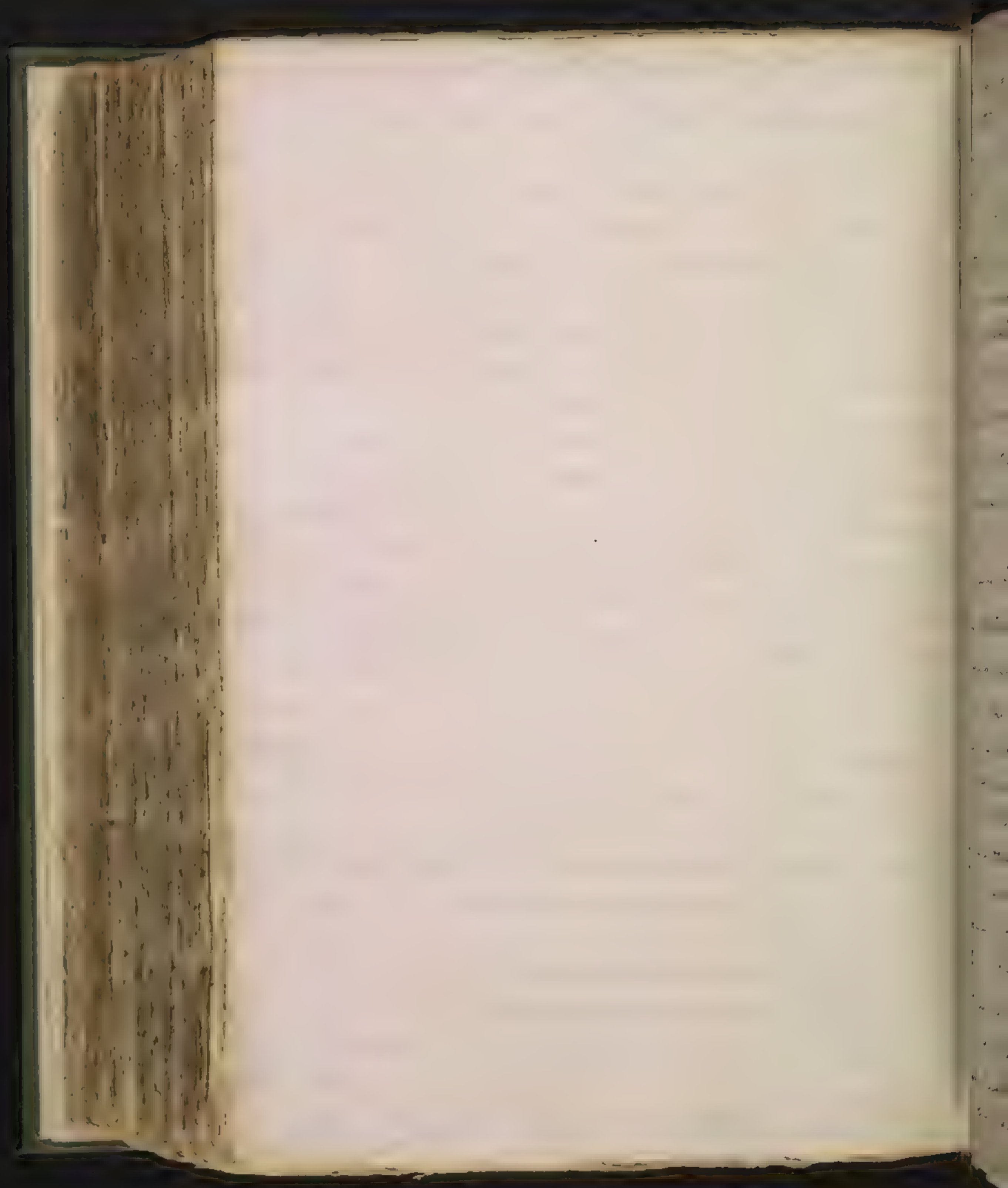


this therefore should always be the test that is first employed
if the white of an egg thrown into it acquires a yellowish color
it is a test of a white precipitate on adding a solution of silver in
the nitrous acid

We have reason to believe that copper is soluble like iron in
volting the intervention of fixed oil and its presence may
be known by 1st the green or blue color of the water 2nd by being
precipitated by hy. mag. and 3rd by acquiring a deep blue
color by the addition of a volatile alkali.

Of the Neutral Salts Glauber's and Common Salt are the
only ones which are present in Mineral waters. The I suspect
that is taken for a Glauber's is an Epsom Salt (The Mineral water
presumably containing Epsom Salt may be known by 1st the
white foam test that accompanies it 2nd by their shape
it being of a hexagonal prismatic form) The presence
of Epsom salt is known by the adding a fixed alkali which
precipitates magnesia in a white powder 2nd by its vapors
ion. The presence of common salt, which is the most frequent
known 1st by the water becoming turbid upon the addition
of a solution of silver in the nitrous acid 2nd by evaporating
whereby if common salt is present we will obtain a usual
white salt. We are furnished with many marks to dis-
cover the presence of Nitre Borax &c. in Mineral Waters
but we have good reason to conclude that there are never
found in mineral waters

of the Earthy Salts Selenites and others are the most
common. The first may be detected by the water becoming
turbid upon the addition of an alkali and a corrosive
spirit being poured, and by being evaporated. Selenites
may be known 1st by the white milky color of the water by
precipitating



precipitating with an alkali and 2nd by a solution of Borax which is decomposed

In the 1st of the found Inflammables soap and a Hepor Sulphuris has been said to have been found, this has been said to exist in the waters because they have in some cases the smell of it, but no argument can be drawn from smell for no one would suppose that a Hepor Sulphuris existed in a rotten egg yet the smell is similar. Another argument for the existence of Hepor Sulphuris in waters has been drawn from their changing the color of leaves but putrid exhalations will do the same instead of Hepor Sulph. would suppose these waters were their vitriol and smell to the juice of for this has the same smell and will turn leaves black when a mixture of some other substance. The waters lose all their virtues by standing for a few hours

In the Metallic Salts the Blue Green and white vitriols are found in Mineral waters. The blue is distinguished by the marks of Copper, the green by those of iron. The alkali improves for Prussian Blue precipitates the iron of a deep blue color which it will not do if it is in its simple state. The White by 1st by changing blue into white vitriol and by emitting a fetid black vapor upon the addition of mercury and 3rd by having a fetid matter floating on its surface upon the addition of vitriol acid 4th by evaporation Besides these substances vital air is always present in waters. Fixed air may be discovered 1st by its imparting a pungent taste to the water 2nd by its having a house motion. 3rd by its rendering caustic alkali mild when held over it 4th by extinguishing flame if

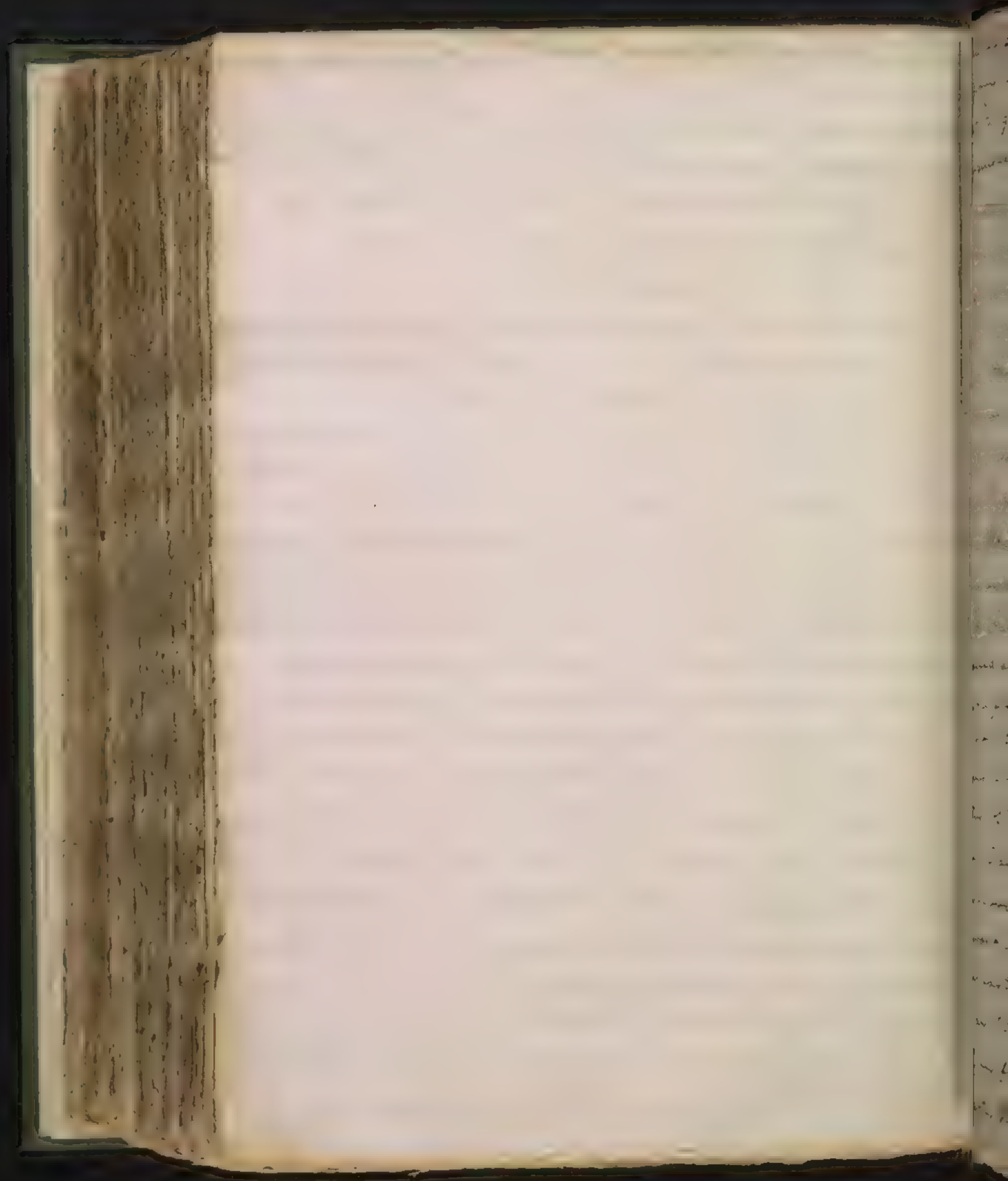


if brought near its surface and 5th by its pernicious effects
on animals 6th by a chemical distillation in which
instead of a receiver I should tie a bladder to the neck
of the Retort in which all the fixed air will be collected.
Pyrmont water owes all its virtues to fixed air.

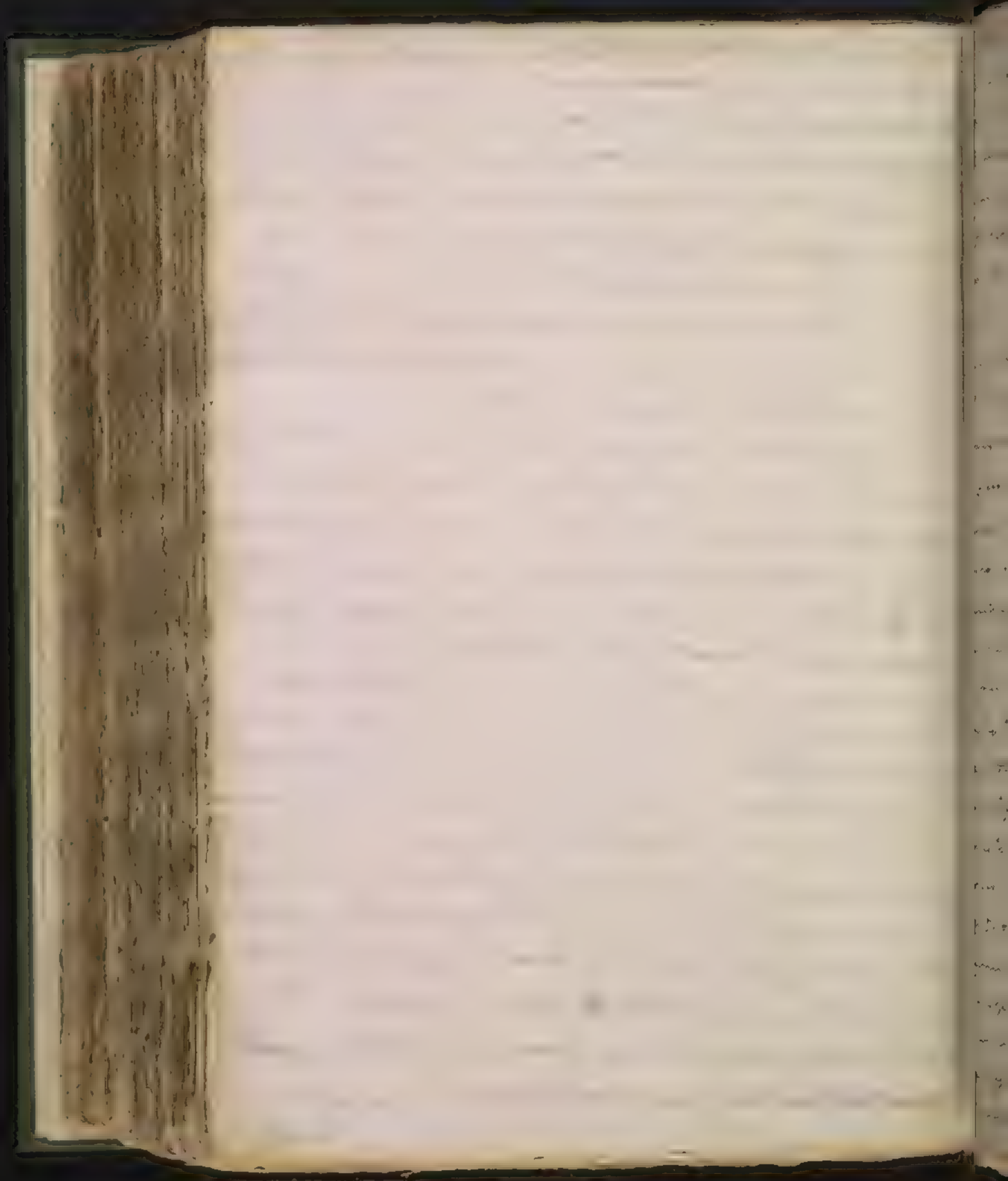
The next Class of bodies are the

chlorial

the species of airs are Fixed, Inflammable, Phlogisticated, De-phlogisticated
common air, Nitric acid air, Nitrous acid air, Muriatic
acid air, Alkaline air & Aquatic air Fixed air Phlogisticated air
is sometimes called Urethral acid extinguishes flame and is
fatal to animals. It turns the tincture of turnsol and of violet to red
fixed air by heat is converted into nitric air it has no great effect
but it sends out a very strong one to Alkalies $\frac{1}{4}$ of a milol
of fixed air & calcareous earths contain a large quantity
of it The Alkalies and the calcareous earths are rendered ^{caustic} ~~acid~~
in its expression by the inflammable bodies charcoal contains
the greatest quantity the explosion of gun powder is
owing to the fixed air suddenly set at liberty from the char-
coal by the inflammation of the Nitre and Sulphur. Fixed
air renders iron and Zinc soluble in water in small quan-
tities Water impregnated with fixed air promotes fermenta-
tion At Saratoga it was used by our army instead of
wort and answered the purpose very well The Pyrmont
water owes all its virtues to fixed air, this water may
be artificially made as to the origin of fixed air it is
found naturally in many parts of the World as in
Wells. In this Country you often hear of people being
killed



filled by going down into Wells long neglected hence the
necessary caution of lowering a ladder before a person at-
tempts to go down the Well for I before told you fixed air
extinguishes flame. It is found on the surface of the ground
in many places The Grotto del Cani in Italy near Na-
ples is most famous for it. It runs two feet above the
surface according to Keyser. Gunpowder cannot be
burnt in it. Different animals live different lengths of
time in this air, in the same degree as they do in an exhaust-
ed receiver. The Thermometer and Barometer and not affec-
ted by being placed in this air another source of it is from
fermenting Liquors as Beer Wine &c. Another source is
from Alkalies and Calcareous earths. It is also produced
by fire and the breathing of animals which produces evolution
the ϕ which mixes with common air and forms fixed
or called also phlogisticated by Dr Priestly. But in my
opinion fixed and Phlogisticated air, and of the nature
that from the lungs of animals is certainly of the same
nature with fixed air, it having the same effect on the
inertness of Turnsole. The Breath of animals also extinguish
a flame and proves deadly to animals. You must all
have heard of the death of the Englishman at Solent the
air was owing to this breath. Suppose the mercuri-
al parts of the System and thrown off mixed with
fixed air. This may be the ϕ which mixing with
atmospheric air forms fixed air. From this I shall suggest
hereafter that the end of respiration is to generate
Heat



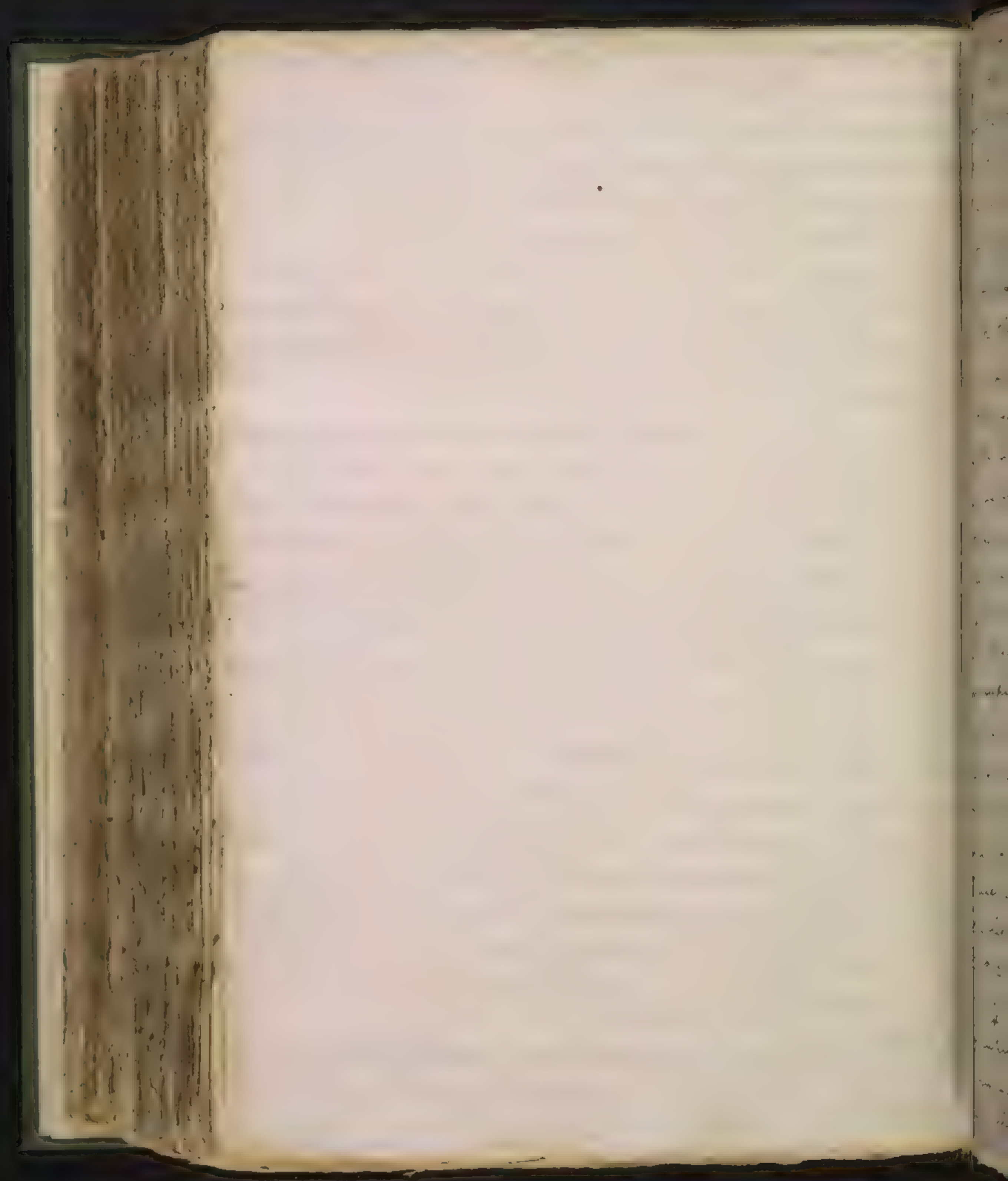
rest. All bodies about to dissolve by putrefaction evolve the
which mixes with the vital air it meets with and by this
modern mixture produces heat fixed as likewise exists
in the perspiration & Mr. Braid proved this. You yourselves
may prove it by an easy experiment In the Morning
the cloths have been well changed with the perspi-
ration during the night if a candle is introduced un-
der it will be suddenly extinguished; from hence
winning in the unhealthy tendency it may have to cool
the Bed after getting out of it also shows the necessity
of changing the linen in putrid disorders. What on the
use of fixed air. Dr. Prouty has shown that its use in the
natural world is to nourish vegetables therefore trees
near houses are supposed to make them healthy by
attracting the fixed air. Some persons have suggested that
the uncommon sickness for these few years past was owing
to the trees which formerly surrounded this City being cut
down by the British army. This I think is going too
far and the sickness may be deduced from another cause
now artificial swamps have been made and therefore
as trees to obstruct the Miasmata from Shagbills
works. I am induced to make this conclusion be-
cause 50 or 60 years ago no fevers of the remittent
or intermittent kind were known within 40 Miles
of Susquehanna now the Country has been cleared
they are very frequent all round within 16 Miles of the
River & gentleman from Chester County informed me
that nine mills were erected in so many places & that
they were to
may



and more common than formerly. What are the effects
of fixed air on the system? Fixed air is used medicinally as a
salutary a considerable quantity is excreted during digestion.
Whether however after a full meal is owing to increase of the
secretion or the sedative action of the fixed air cannot be
determined but probably is both ways combined. Fixed air
is used as a medicine among the natives of America used
in various ways but vinegar is far more common
and the propriety of sprinkling the floor with vinegar in
interior fevers.

Inflammable air is the air united with pure air; its specific
gravity to a mean atmospheric air is as 1 to 10. If a
candle is brought near it, it will take fire and explode.
It can be obtained from metals by the effusion of acids. It
is used for the purpose of making Balloons rise. Refined
air is also used for this purpose. The inflammable air for Balloons
is generally obtained from iron filings, and the Nitrolic
inflammable air will not mix with water. There are other
sources of it besides metals. Some caves naturally contain
it and it is called fire damp. This also occurs in mines. In
natural air is also inflammable, we have all of us no
doubt frequently heard of persons being consumed by
natural fires which fire does not extend to the body
either, is it not possible that this may be owing to
some communication taking place between the intesti-
nal air and the candle upon the persons going
to bed?

Unpurified air or Precipitate called by Lavoisier
inflammable air and by Scheele Empyreal air is in
my



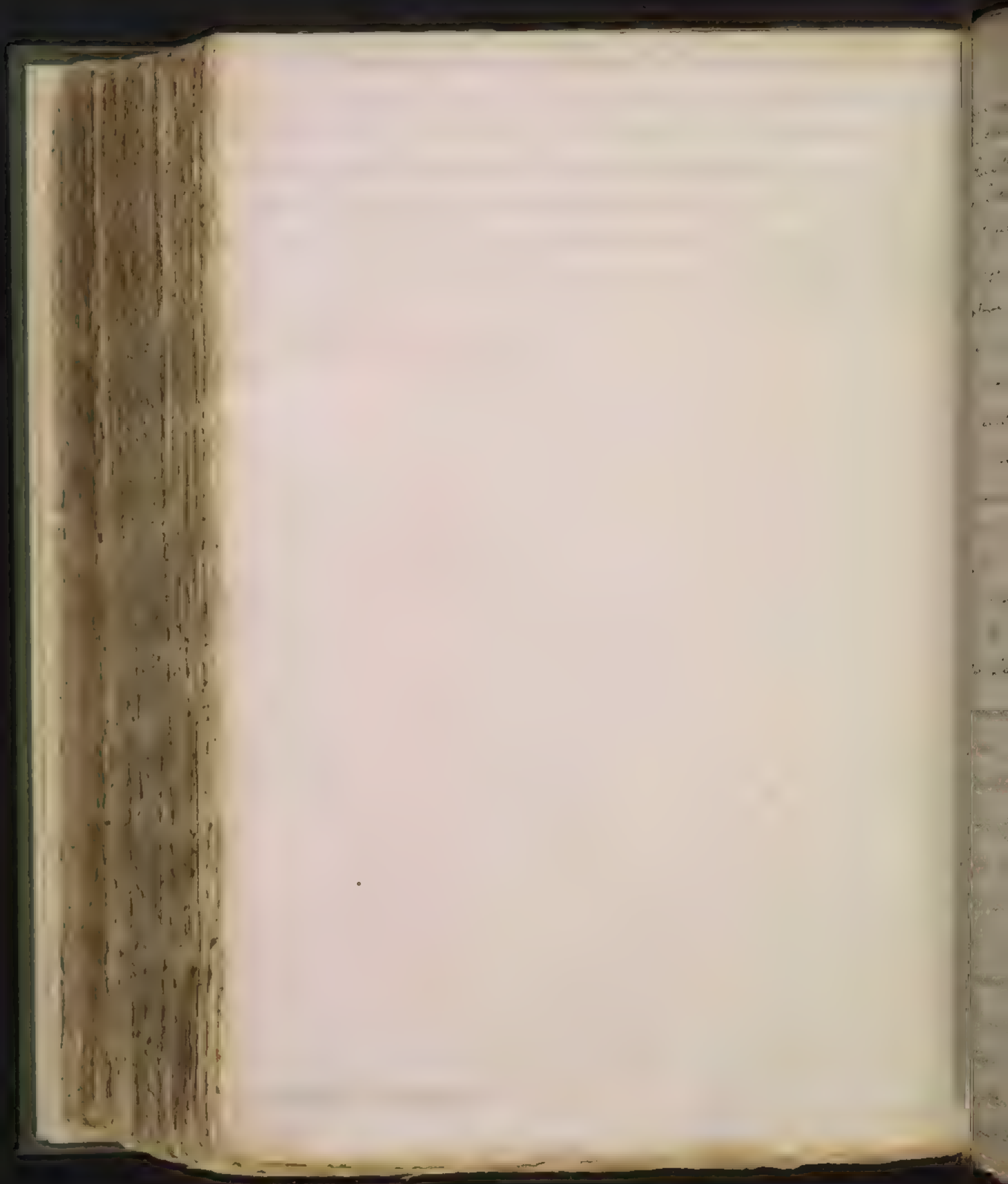
my opinion nothing but air entirely pure without the admix-
ture of the other species of air known. Recently Discoveries have
shown that not one 4th of common air is pure or dephlogisti-
cated. It is the Paladium of life. Animals live 5 times as long
in it as in common air. It is very exhilarating so that that
with it and a lighted taper when immersed in it will
keep its flame very much increased. From the experi-
ments of the ingenious Mr. Ingenhousz it appears that
the most plentiful natural sources of it, it is created and
revived by all vegetables exposed to the Sun in the daytime
and the reason why the air of the Country is so much
more exhilarating than that of the City. Hence the con-
sequence greatly to the health of a City and must be raised health
organs. We should be like the man who goes to a number
of streets the space of air or of the Sun has in them
would thereby become in a very short time in a very
the air impure. It is generated and may be obtained from
them, Red Lead, Red Precipitate of mercury, and also that
of vitriol, it is most frequently obtained from the two first.
Impure air is 2 impure and changed with $\frac{1}{4}$ of it is
ingrues has proved fatal to animals and decompos-
es lime water, hence or I probably before observed it
probably the same or fixed air
Common air is composed of $\frac{1}{4}$ part of Dephlogisticated
and $\frac{3}{4}$ of Phlogisticated air. It likewise contains
many infinites all substances capable of fixing about
the air enters into its composition, e. g. contagious
articles, Miasmata mix with it, odors of all kinds
both.



equable and disagreeable. It is therefore very heterogeneous.

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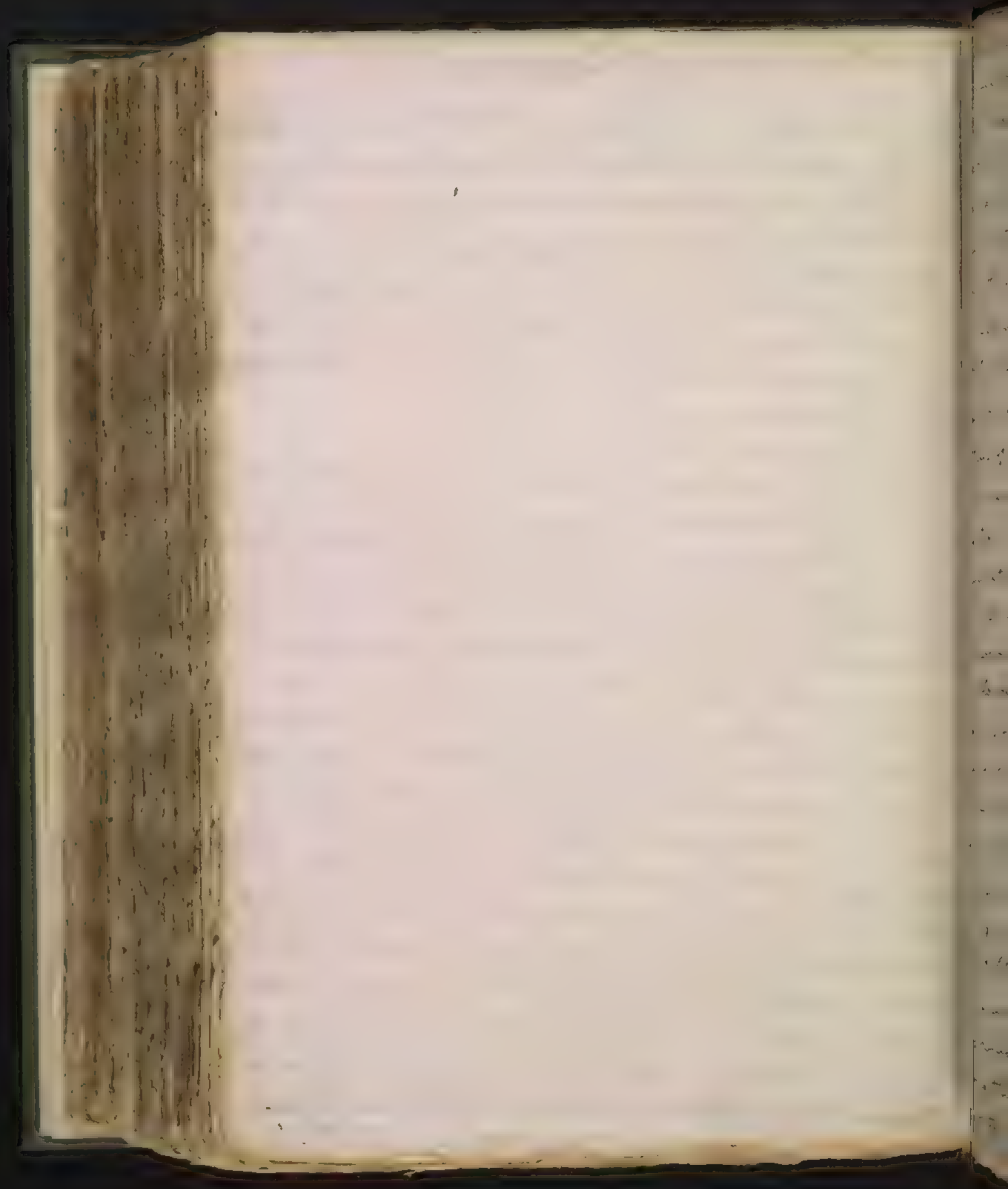
Animal Substances



Animal Substances

We come now to consider the Chemical history of animal substances. When a Chemist takes a view of the human body in a living state, the first thing that strikes his attention is its heat, he observes a principle which this is preserved constant and uniform while in health for over 80 years without increase or diminution and is no way altered by either climate or season. We another more surprised at this or there is no Matter in Nature that bears the least resemblance or analogy to it. Many Hypotheses have been framed to account for this heat some of which I shall mention with the Objections against them and then mention a new one which I think applicable to exceptions.

The reason in the Medical Theory of fermentation is taken a great deal of pains to show that animal heat depends on a fermentation taking place in the blood. The putrefactive kind of fermentation might have given rise to whether fermentation does take place in the blood. The putrefactive fermentation is known never to take place in the body until its texture is so destroyed as to be inconsistent with life. Hence in no case does it take place in the body. This is evident besides when this putrefaction takes place there is no increase of heat but rather a diminution of it and when the patient dies the heat is entirely stopped. Another objection to the Heat of the body being produced by putrefaction is that the heat evolved must be so small as to be dissipated and so is no heat generated but it has been said that tho the generation is slow it is constantly kept up by the aliment but if this were the case the heat of an animal of the same nature would rather diminish than general heat. If we were the cause of heat the heat would be in proportion to the quantity of matter but animals of the same order whatever



and the difference there may be in their size ways to keep
the same degree of heat thus we see the same degree of heat present
in the different parts of a small Mass &c. If this were the cause
that the heat would be greatest in contagious and putrid dis-
eases and less in inflammatory the contrary of which is true
as the heat in inflammatory fevers is greater than in
contagious or putrid fevers it is below the ordinary
temperature. That we may I think safely conclude
that the heat of the animal body is not generated by a pro-
liferative fermentation. Another hypothesis is that the
friction of the blood against the solids or flow of the vessels
the cause of heat and that heat is always proportioned
to friction or owing to this alone. This is only a specious
argument for no matter to produce heat by friction the sur-
faces of both of them should be rough and no fluid mate-
rial interposed but we know that the reverse takes place
in the blood vessels as both the coats of the arteries and the
blood are extremely smooth and the solids also should
extend to some point for a vessel in which the blood
meets the heat neither the blood nor the vessel con-
tributed to be at rest. The velocity of the circulation is
not sufficient to produce the necessary degree of friction
the argument alone is insufficient to maintain the hypothesis
is. But Dr Martine to uphold this doctrine says that
the increase of surface in the vessels against which the
blood drives compensates for the want of velocity, but
allowing this to be the case in small vessels, yet in
vessels of the same size near the heart and those
more



now remote the blood moves it with different degrees of velocity

and is indeed

and is indeed

regarding the movement of the blood in the vessels

it is not the same in all parts of the body

and is not the same in all parts of the body

with it as it has been explained by some of the philosophers

and is not the same in all parts of the body

and is not the same in all parts of the body

and is not the same in all parts of the body

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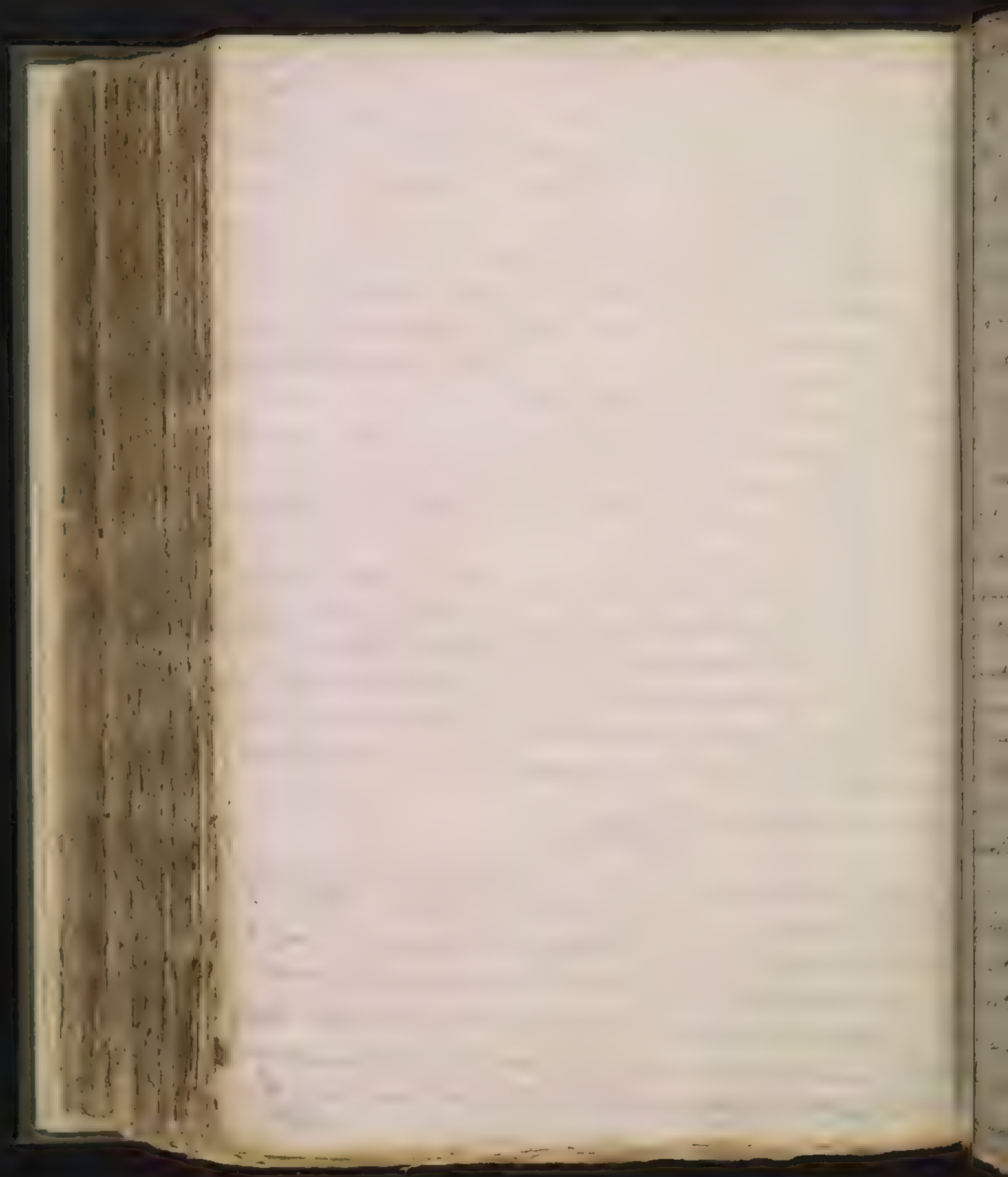
and is not the same in all parts of the body

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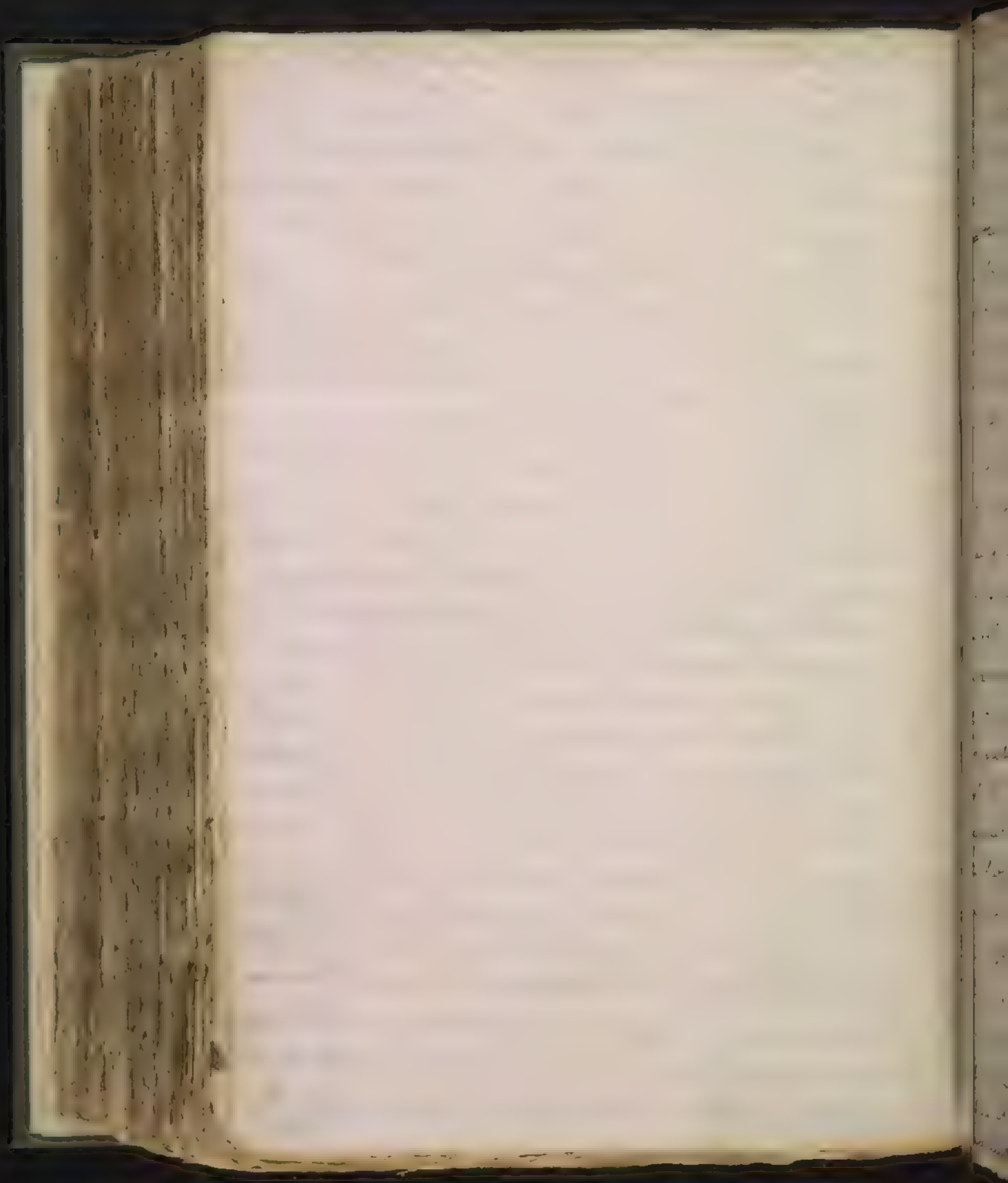
to include the air and coal one or two hundred of the
and quantity of the air is increased the heat in the
the air is increased.

columns. These things being premised, I go on to say that
animal heat is sustained by the ϕ discharged from
the blood in its passage thro' the lungs by respiration.
This sort of heat, the most perfect, is the result of respiration
or animal heat, & is the same as the heat of the blood
as it is supposed to be. I suppose however that the heat
in the lungs may be called the ϕ of the system. It
is an analogy to the heat of a fire any given like
or a fire the heat of a body & produces the ϕ being
discharged or separated the separation of the ϕ in the
lungs to the ϕ of the system of air. The heat of the
lungs is then increased the heat of the body
is increased & more frequently which more of the ϕ is
absorbed from the greater action and velocity of fresh air. The
same is the case in a fever when respiration is increased
the animal heat whether ~~the~~ the separation of the ϕ is
increased by heat formation or the addition of
the substance. To account for it Crawford supposes
that a third substance is necessary and this he supposes
is phlogisticated air. If this is the case he supposes
a simple ether or ather to be taken up & the ϕ is thrown
off during the act while the dephlogisticated air is
taken into the blood. It may be so or the system may be
increased on the same is. The blood may probably owe
red color to an absorption of this ϕ & the air
may be taken up or be removed from the blood get
its red color from an absorption of this species of air.

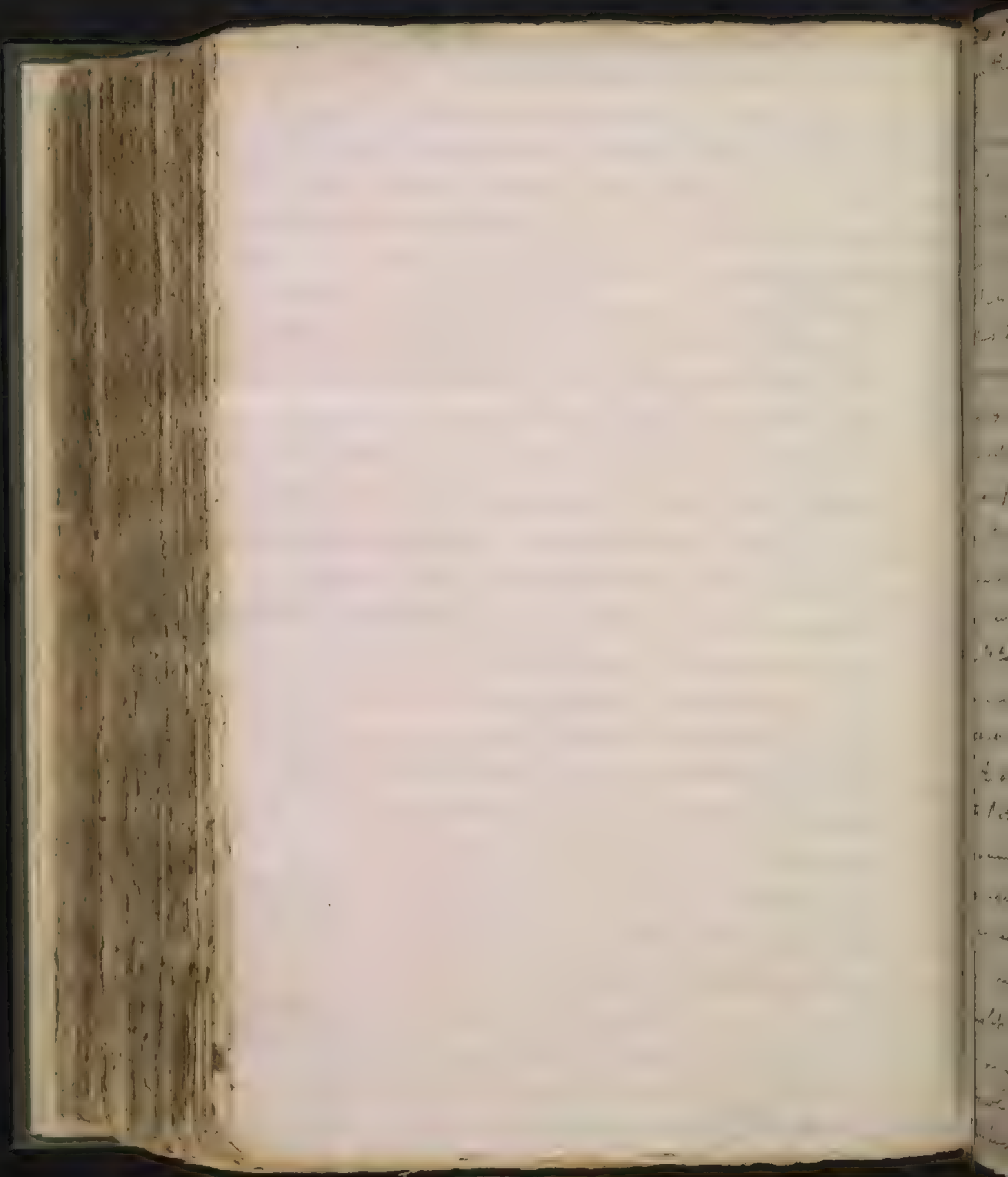




right of the blood have diminished after its deposition. The
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ingenuous Mr. Huxley, the author of the "Lessons in Elementary Zoology," has shown you that the red particles are not red in color, but are yellow, and that the red color is due to the presence of a yellow pigment in the blood. He also shows that the red particles are not red in color, but are yellow, and that the red color is due to the presence of a yellow pigment in the blood. He also shows that the red particles are not red in color, but are yellow, and that the red color is due to the presence of a yellow pigment in the blood.



... indeed that the greater or less degree of coagulability is influenced
by the coagulation of the red globules, thus ... the blood at
... of the ... for ... to the greater
... The ... is more probable than that of
... who ... the ... to be ... to a
... of ... with the blood; the analogy
... of red blood is much in its favor.
The third question is what is the use of the red globules? All
that we can offer on this head is only conjecture. They appear
to be assigned to keep the coagulable lymph out of the ... which is
very much disposed to coagulate to a great ... by retaining
... fluid parts which might otherwise run off by the
... and to ... the growth of the body, or
... compared to the ... which they may elongate.
We now now to treat of the Coagulable Lymph. It is
difficult to find ... from the serum all our
experiments made on this substance and on ... and
... (decisive), but we have a thin substance ...
... (the albumen ...) on which we may make ...
... Both are coagulable by 150° of heat, both are affected
in a similar manner by acids and alkalies, both are
... of ... of the animal. They
... however in some particulars 1st the albumen ...
... mild and bland than the coagulable lymph
... saline particles than it 2nd the albumen ...
... in the cold but this is owing to the
water which it contains. If it is dried and afterwards
proper proportion of water added to it, it will re-
main



It will show in a Bessel's view.

fluid in a degree of animal heat and it will coagulate
the Cold Test was first proved by Dr Buss who published
a marginal dissertation on the blood which is the founda-
tion of all the improvements that have been made on
the subject for the last 20 or 30 years. From there was
no doubt that they are the same matters once
naturally and under the same purposes in the animal
economy. Little difference can be held on the ap-
pearance of Buss in blood cells. The appearance of
the coagulable & impurities which have been looked upon
as work of inflammation and some have even con-
sidered it as the cause but the appearance often depends
on accidental circumstances. It can afford us no
prognosis or diagnosis unless we attend at the same
time to the state of the solids. Blood flowing in a large
vessel into a narrow cylindrical vessel shows more
Buss than when it flows in a narrow stream
into a broad vessel. The situation of the blood after it
is narrow also influences the appearance of Buss. When
it is in a narrow place it is greater quantity of the Buss
and the red globules fall to the bottom and a large
proportion of Buss is left at the top. The materials
of the blood are composed of elements the appearance
of Buss is an earlier vessel shows more of this than
other. More also appears in cylindrical vessels than
in flat ones, a rough plate in which there is cavity =
= quantity =



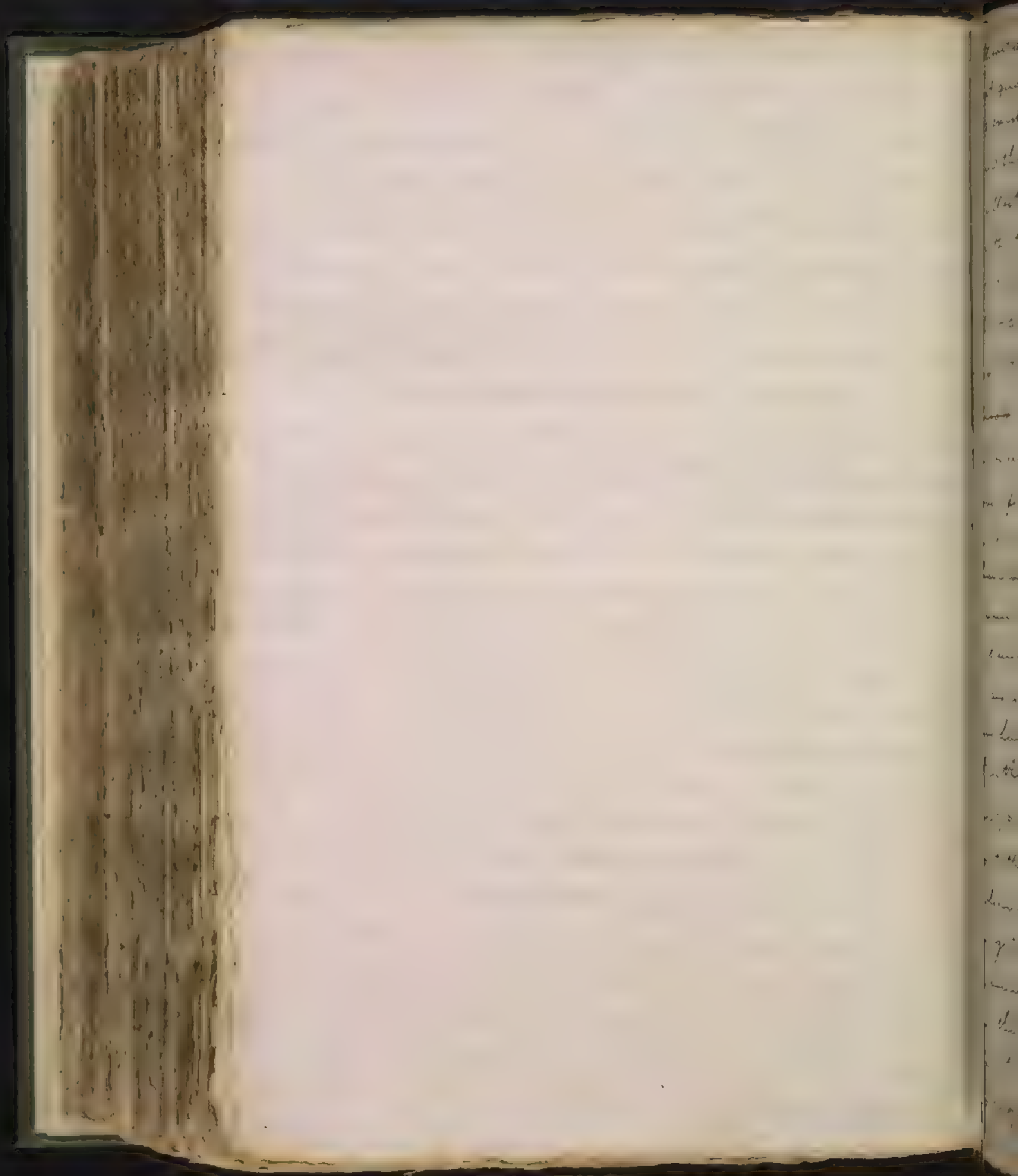
mentally blood, will show no 2nd part in a blood will show more than a plate: But after all dissects that coagulable lymph

can be greater if ...
... of the vessel and arteries rendering it more or less ...
... and left off to retain the red parts, or it may separate in the body when the particles of the blood are not sufficiently mixed and the union is left from 2nd when there is not a sufficient degree of heat 3rd when there is a substance applied which has a stronger attraction to the lymph than the other parts of the blood Polypii are formed and Hemorrhages stopped when the coagulable lymph meets with some substance to which it adheres When the arteries are dried on account of their mucus being abraded, the Polypii is easily formed from the coagulable lymph adhering to them, thus leads us to the use of drying applications in Hemorrhages and in this way stop and dry but stop them.

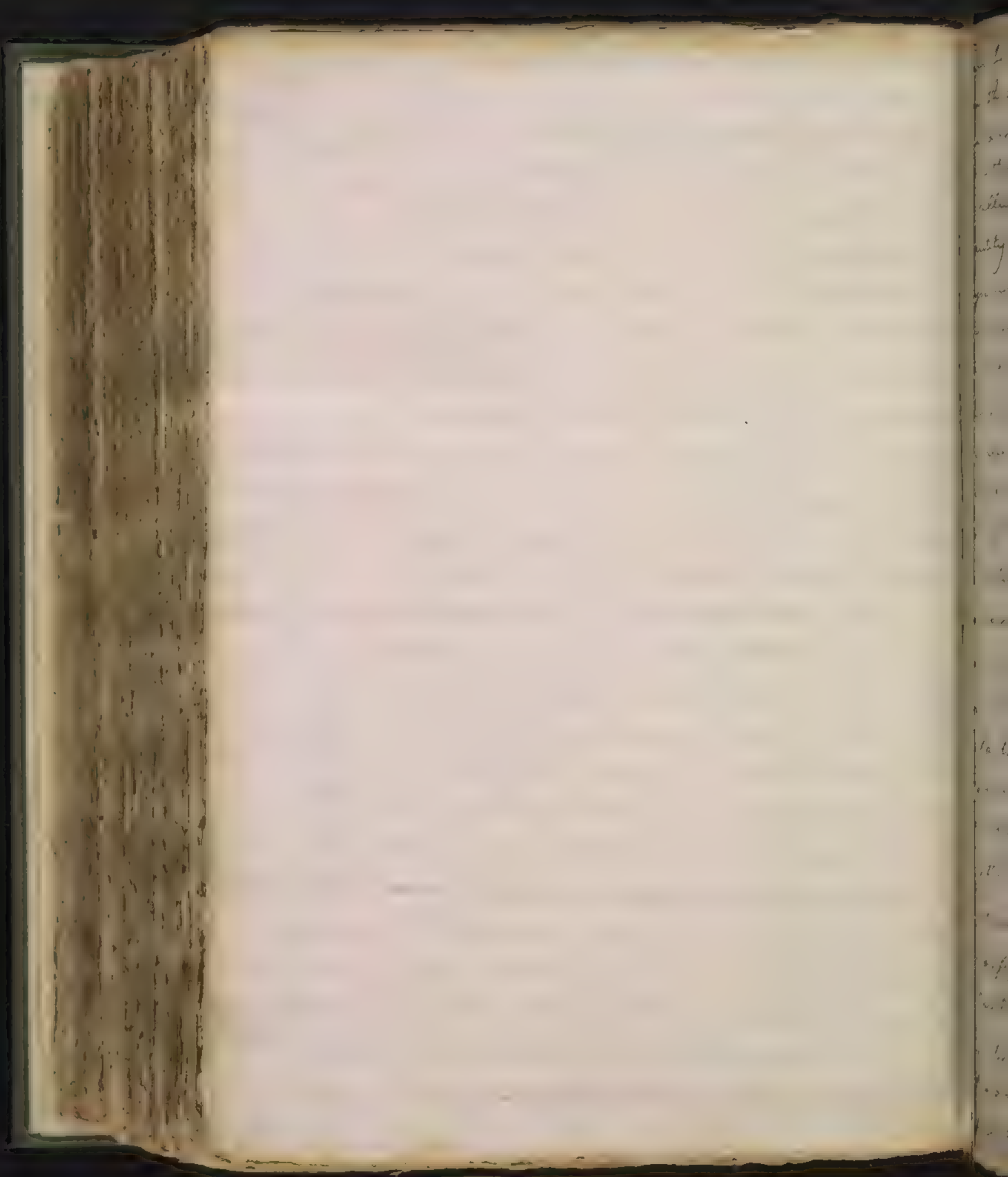
The third part of the blood is Serum this appears to be nothing but salt dissolved in water. this salt is of the ammoniacal kind and is composed of an alkali that is the same with the volatile alkali and an acid of a particular kind called the acid of urines. It tends to make the coagulable lymph more soluble in the serum. The habitus is the more watery and volatile part of the serum. The coagulable lymph mixed with the serum is called by some the serum. As to the proportion of the three parts of the blood nothing can be said with precision this different in different constitutions and different states of the system. Besides it is difficult to procure the different parts in



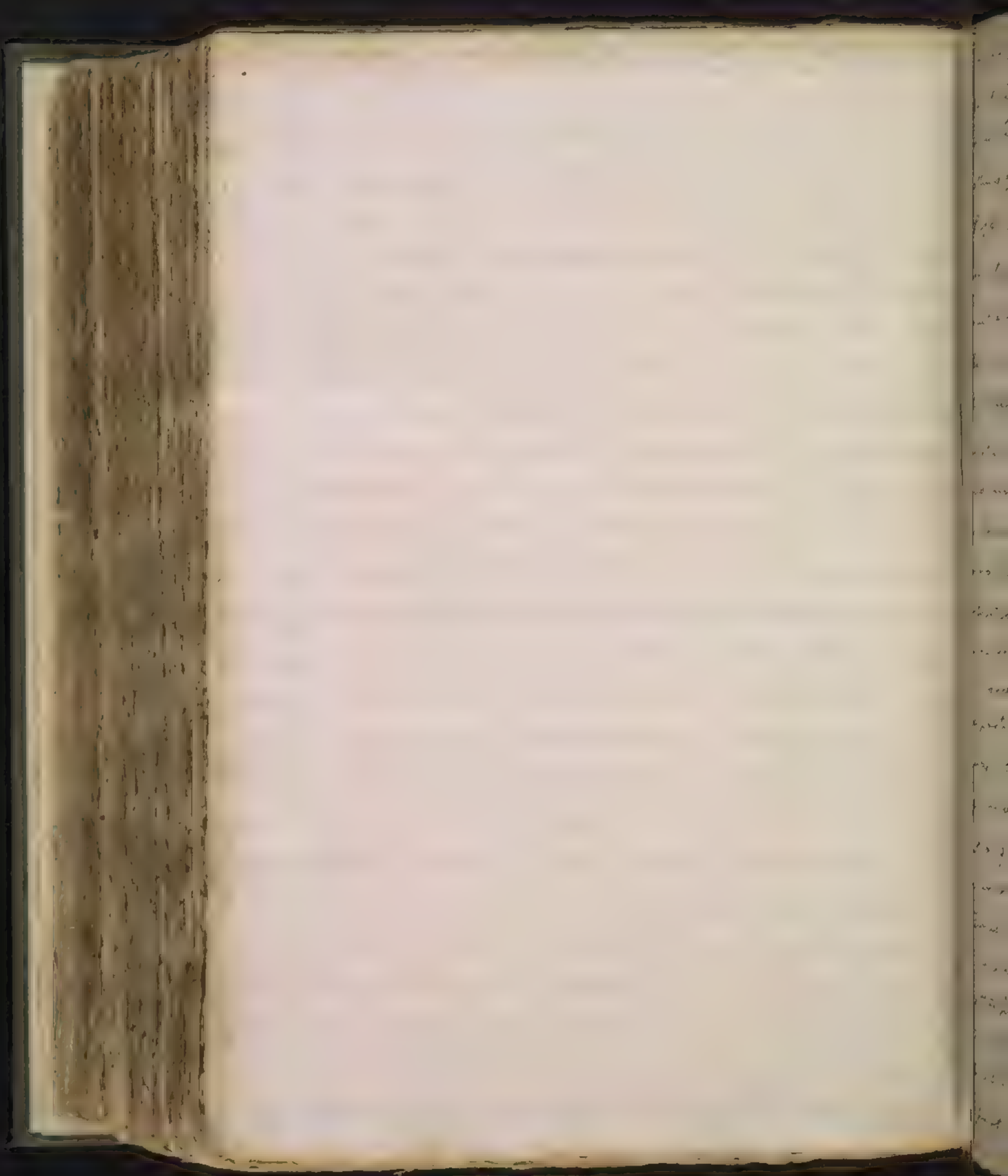
a separate state, indeed it is of little consequence or consequence
symptoms by which we can tell when the proportions are de-
stroyed within the body. We shall next consider what other
matters enter into the composition of the blood. Some
we supposed that chyle was present, but of this we have
no satisfactory remedy evidence; this opinion must have
arisen from ignorance of the nature of the food. What this
is mistaken for chyle was probably nothing but a
lymph. Chyle may be present tho not perceiv-
able to our senses. Some of this opinion or milk seems
to be secreted from the chyle. Drs Haller and Senac
suppose that there is a mucus or gelatinous substance
present in the blood. Dr Haller infers this from our taking
so much viscid and gelatinous aliment, but this is
no proof because our food is quite different. The as-
similating and digestive powers, before it enters the blood
Senac supposes a mucus present because we can
squeeze a greater quantity of mucus out of the follicles of
the stomach of a small animal than can be supposed to be
due to them, the mucus abundant quantity he thinks
must come directly from the vessels, but we are not
acquainted with the size of the follicles and therefore
cannot determine what quantity they may
contain. If secondly, ever so large a quantity had been
squeezed out it does not follow from thence that it exists
in that state in the blood for all the reasons
when first made are thin and watery.



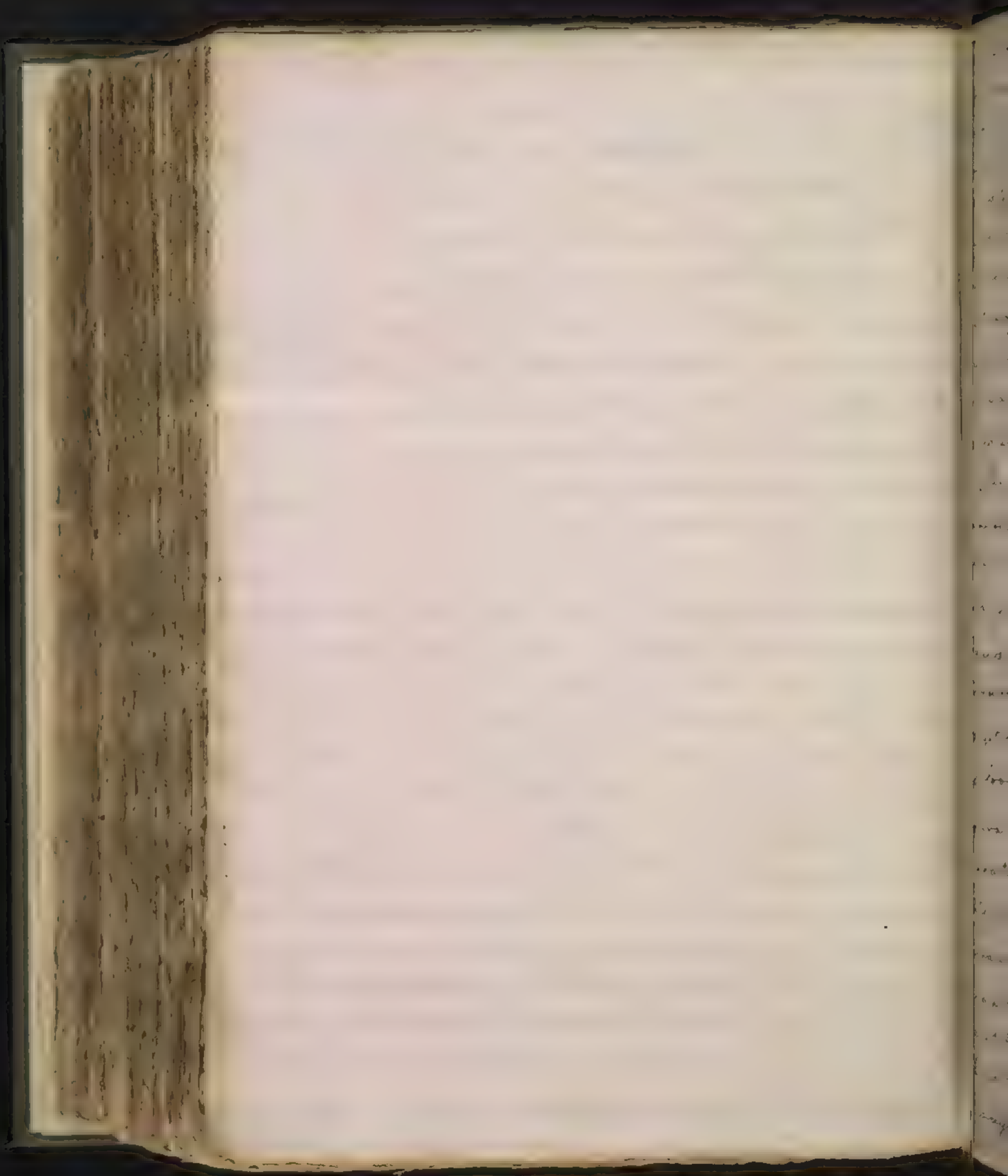
Is there any Oil in the blood? We certainly take in a great quantity of oil in our aliment but this is no proof of its existing formally in the blood. Dr Haller says we know the formal existence of this oil as we often find it all attested that we may easily reject them. It is not that any person has certainly seen oil in the blood it does however in any of our exist materially in the blood. Another question is whether ^{there} is any air in the blood? Fixed air certainly enters into the composition of the blood animal bodies. But what we mean is whether air in its elastic state or in an intermediate state between fixed and elastic air enters in the composition of the blood, we have some reason to presume that it does. We have no reason to believe that water comes in air in its elastic state or may be rendered evident by placing it under the exhausted receiver of the Air Pump, and when air is evolved from the blood by putrefaction Dr Havers has proved by experiment, that air really does exist in the blood, he made two ligatures on the carotid artery of a dog at a considerable distance from each other, he then cut out the tied part and threw it into a pail of water and observed that it swam on the surface, he then took off the ligature from one end and after having again tied it he threw it a second time into the water and then observed that it sunk to the bottom. We have another experiment to prove the existence of air in the blood If the blood freezes immediately after being drawn, all cavities will



will be observed in it which upon being pushed under water with a pin send up air which appears on the surface of the water in bubbles. I cannot finish this subject without observing that there is a vast host of the cellulose membrane that necessarily contains a great quantity of air in an elastic state. This we found from the Phlegmas which is, present in every part of the body. I imagine that air is secreted or poured out into this part and that it is of great importance in many diseases perhaps which are not yet properly described and owing to the different states of this secretion, or the excess or defect of it. Having now finished our Physiological history of the blood in a molecular state, I am next to consider the chemical history of the same or other substances that enter the blood in a mixed state. This is a very important branch of Medicine or from what we learn the changes the blood is capable of undergoing in disease. Chemistry must be our guide thro this labyrinth. I now and lead us to the knowledge of truth. Physiologists and Pathologists have for above 2000 years placed the cause of diseases in the blood. Most of the Systems of Physic till lately have been founded upon the hypothetical doctrine of the blood being the seat of all diseases. is universal for this opinion even tho't when dramatic writers mean to ridicule our Profession they make their characters talk very grossly of Bad Humors and Bad Blood. Even Nurses will talk of weeping and weeping about purging and waterizing the blood. I cannot imagine what induced Physicians to suppose that the seat of diseases was in the blood or that the



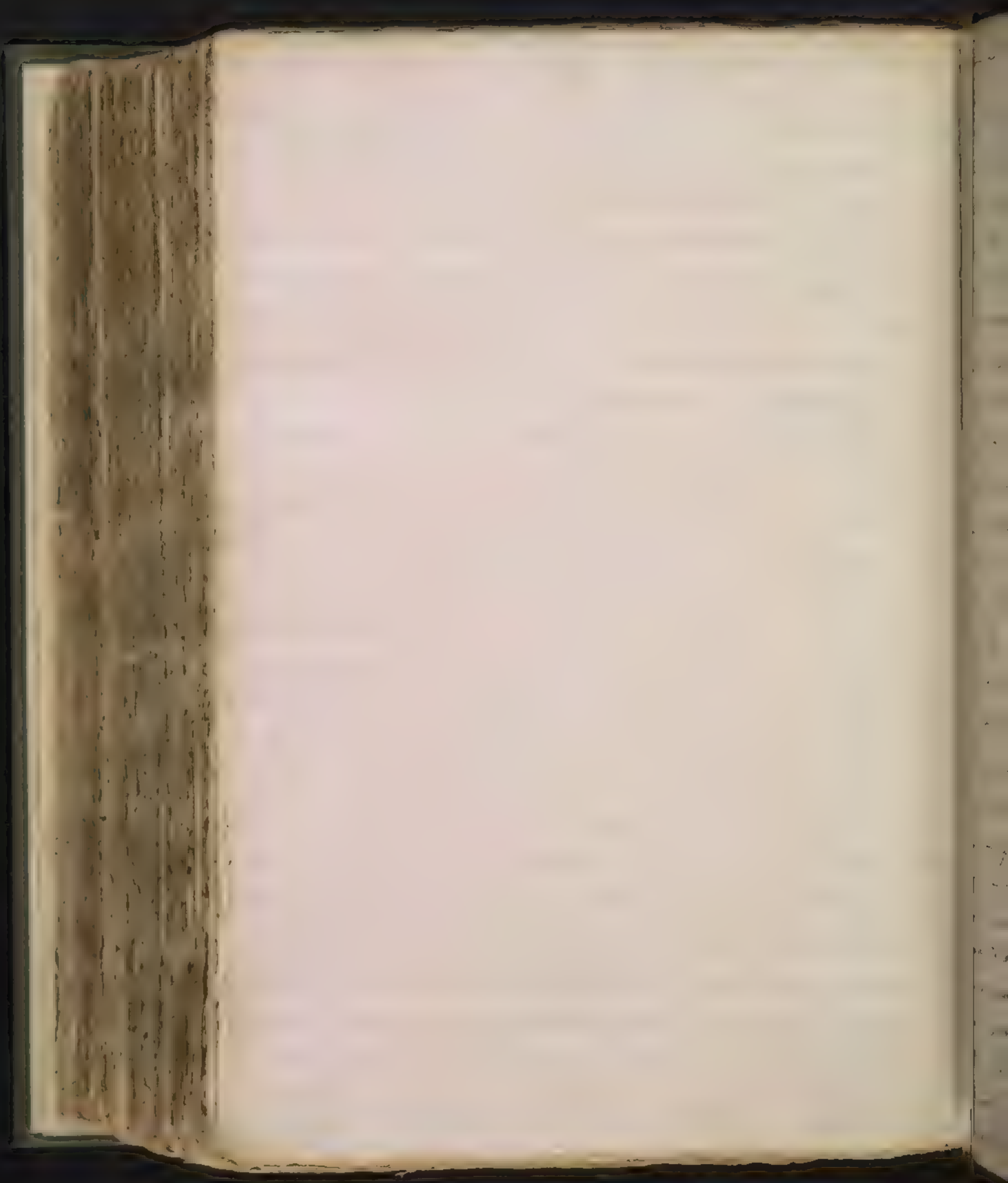
the only part of the body delicate of those circumstances which
renders it liable to diseases or it has another sensibility and immu-
nity. Till within these few years Physicians knew little
nothing of the nature and composition of the blood, till Dr
Hull of Edinburgh gave a good account of it, which was carried
to perfection by Mr Hewson. All that I shall aim at now is
to point out a few of the mistakes that have generally pre-
vailed concerning different matters existing in the blood.
We shall first treat of the qualities of the blood with regard to
consistency, this we know to be of a middle degree between Wa-
ter and mucus not so fluid as the one nor so viscid as the
other. When it grew thicker or more viscid Lector was said
to prevail and it was supposed to cause diseases which were
hence said to arise from Lector particularly fevers, (this
you will find fully treated of by Dr Boerhaave)
this disorder was supposed to consist in too great a quantity
of red particles or from the coagulable Lymph coming in
excess, which may depend on a particular aliment or mode
of life. In answer to those who suppose Lector owing to too
great a quantity of red particles, no one can ascertain the
true proportion in which they exist in health. All cal-
culations made with respect to this except or defect are uncer-
tain. It is very difficult to procure them separate from
the other parts particularly the coagulable Lymph.
Some have supposed that this proportion might be determined by
the specific gravity of the blood and Globules or that one the
only part that is specifically heavier than water, but we



and never obtain them from enough. It is a common notion that they
are formed or that air must be added most of them. In general
the abundant most in healthy vigorous animals is which is not strong
menstruating powers but this is no rule to exception. Thus in
and in a glabrous the blood in two which is a strong of men-
struating powers, they are in a greater quantity, in, as in
in febrile and inflammatory disorders, but they are not
in a state of leucor or they are the consequences and not the
cause of the disorder. As to the morbid viscosity being related
to the coagulable lymph. Some new difficulties arise unless
we could ascertain the quantity of it in health, the tempera-
ture of the air, the velocity with which the blood flows out
the orifice and the time it takes to coagulate. We can never
be able to form a judgment of the proportion of it in dis-
ease. If any thing can alter the spiritus it must be
the causes that induce them. Dr. Gaurus says that in inflam-
matory fevers alters the mixture and the quality of the
blood, yet Dr. Cullen informs us of an Epileptic patient,
whose blood appeared in a dissolved state and dry but when
being drawn the next day it had a Buffy appearance or
thick coat. Dr. Gaurus supposes that if the quantity and
quality of the coagulable lymph is increased, at the same time
accompanied with a vigor of assimilating powers the quantity
of coagulable lymph ^{will also} be increased in proportion
and that the strength of the solids is increased in proportion
and hence resist disease, and even supposing a greater quan-
tity of coagulable lymph with weakness of the solids
yet -



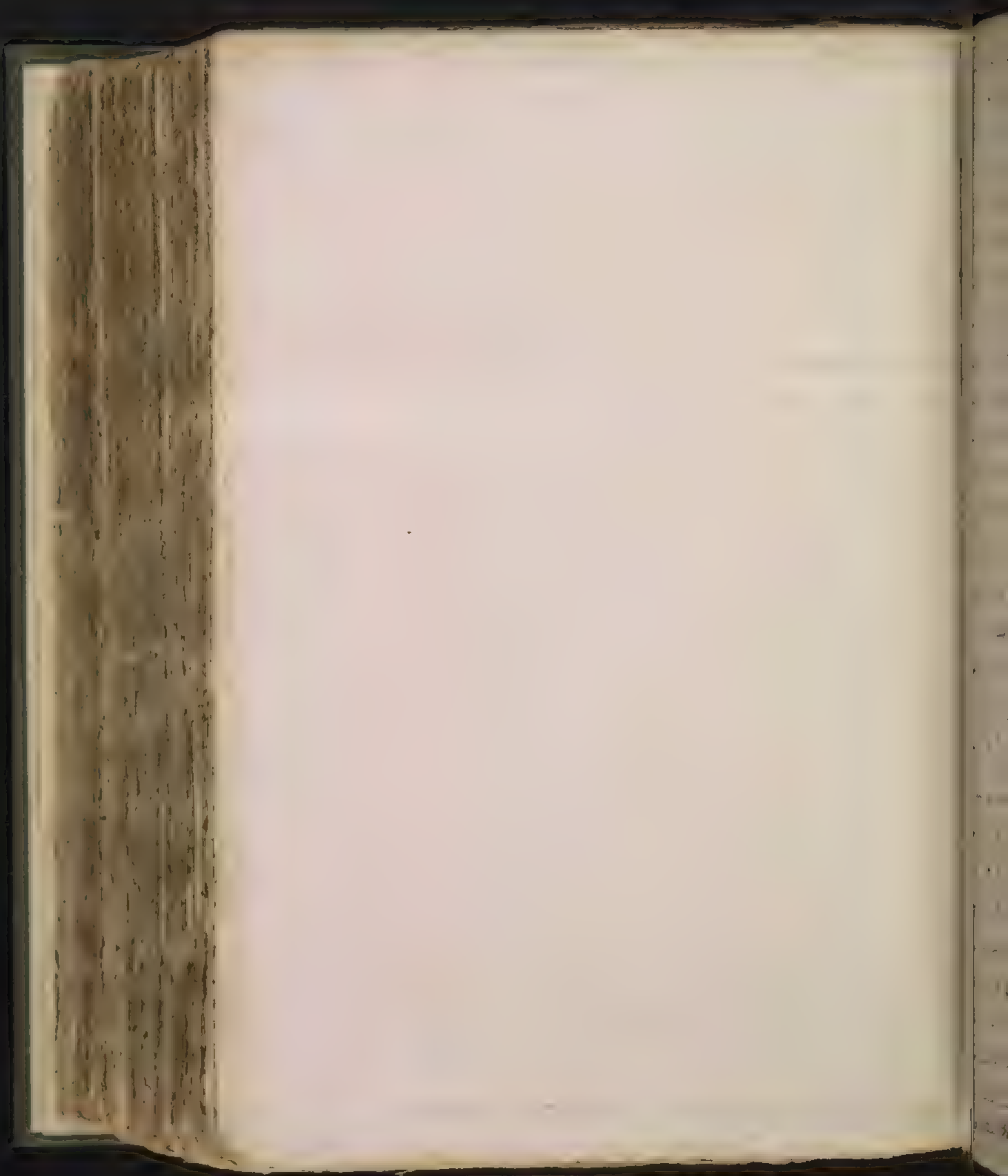
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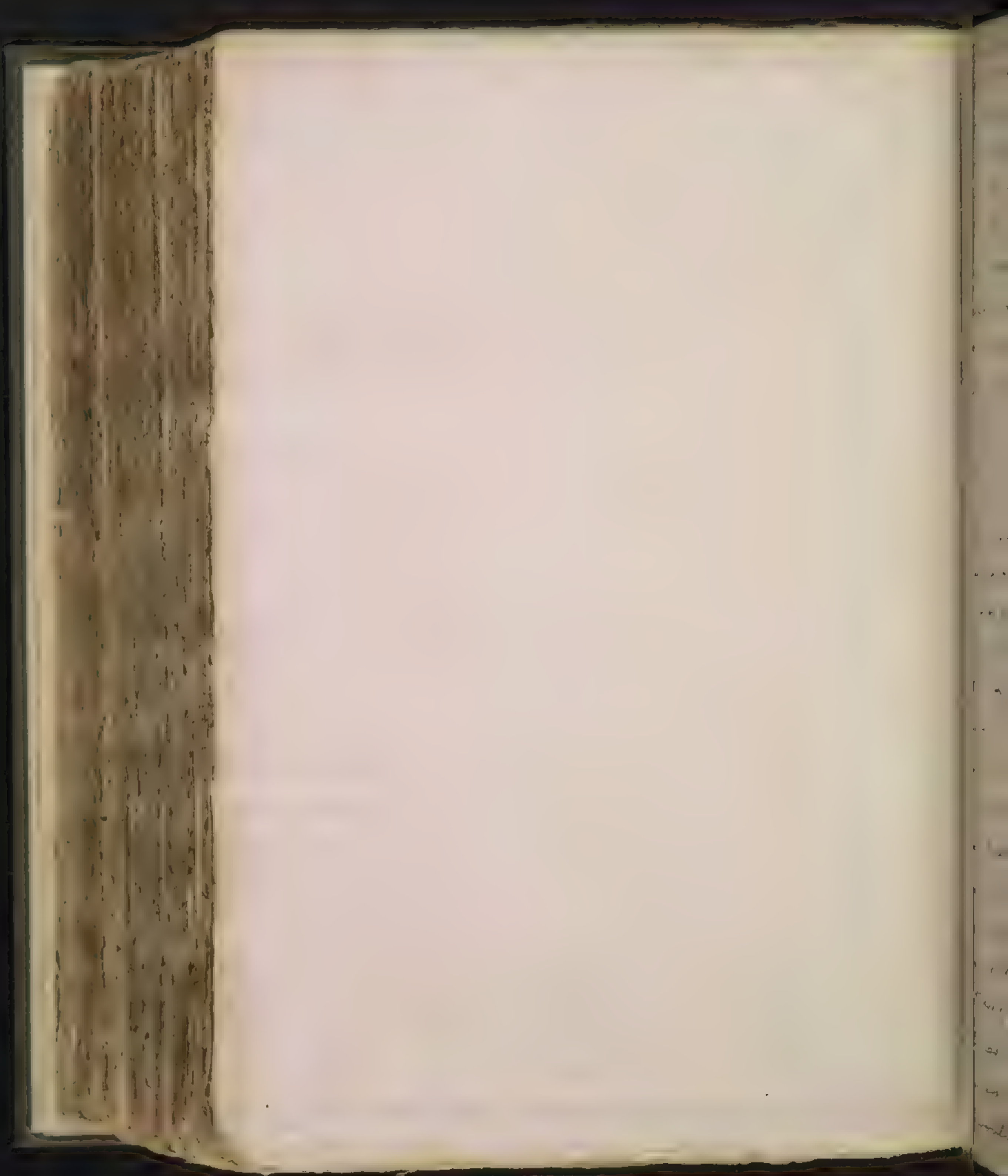
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The human mind is not a blank slate, but a complex system of ideas and emotions. It is a mirror that reflects the world around it, and it is a tool that we use to understand and shape that world. The mind is a vast and intricate landscape, filled with thoughts, feelings, and memories. It is a landscape that is constantly changing and evolving, shaped by the experiences we have and the knowledge we gain. The mind is a powerful force, capable of creating art, science, and culture. It is a force that has shaped the course of human history, and it is a force that will continue to shape the future.



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It is in some cases than common I might have informed
you that there are no direct stimuli to the heart and arteries they
at first act on the brain and nervous system and then that on the
heart. The next enquiry is whether there are any salts in the
food. In mammals they are generally from want of stimulus
particularly of the vegetable kind. In man and several other
the powers generating heat & from stimulus in the food
as aeruginous, but from nitrogenous substances is found
amongst the stimulants, particularly what the food thus will
be changed from a solid to a liquid in the stomach, and it thus
becomes more easily absorbed. In the case of the human
organism a fluid is secreted which is called gastric juice, and
the power of the stomach is to convert the food into a liquid
state or emulsion. The matter is not solid and is retained
in the stomach and made up of these. At the heart sits
which has been seen of an acid accompanying in the blood and
in the stomach much inserted in the cause of many diseases
as the gastric cancer, & gastric and to the heart. That
in acid is generally evolved from our aliment derived
from it is generally a solid and is not that this
and continues unchanged and in this state enters the
blood. It is not so readily absorbed as the food but destroys
the food by means of which it is converted into a liquid
state and forms a liquid which is known to our
experiments that acid and matters mutually destroy
each other qualities and an acid is never found in the
intestines. I suppose the acid formed in the stomach
enters unchanged till it reaches the intestines
if it would be diluted by the fluids in the intestines if
it

+++ but it never deserves a name reputation. How is it
possible that an acid should be found in such large
quantity in the sweat and yet never be perceived in the
Blood. But what proves that it does not exist in the
blood We know how much it intermixes each other

it escapes the bile and its efforts to be destroyed merely by dis-
solution. It is not that it could not be taken up by the lacteals
it would rather be taken up by the lacteals in the lymphatic system
but an acid exists in the lacteals after the digestion of the
food. It is a free base or an extraordinary one the same
as the blood but it would seem in the blood it is
combined with a base. It is not that it is a base
if taken into the body will be changed into a volatile acid.
Two arguments have been brought in favor of an acid in the
blood first that blood milk is effervescent and yields an acid soon
after it comes from the breast but this is owing to the milk being
fermented and did not exist formally in the blood. It requires
just air and not so its permanent one does not exist in
the body. Secondly, that acid smells have happened in ^{beavers}
has been the right one argument of great weight. It is
would admit that mucous acid and other acids are
found because they smell like each other? or who would
say that many vegetables even when growing have
gone the putrefaction fermentation becomes they have
a fetid smell. But what proves that it does not exist in
the blood is that no blood effervesces with alkalies or changes
the hyaline of white to a red color. There is therefore no fer-
mentation for the formal existence of an acid in the blood.
It is next inquired into the existence of alkalies in the blood
and first of fixed alkalies. This salt is produced by nature but
the action of fire is necessary to its extraction yet what is then
analogous to this fire in the blood to do this? and yet some
are supposed that this salt exists in the blood in a compound
state of alkalies. It has been much used in the treatment of
the blood yet not in the way of the blood as generating an al-
kaline.



acrid acrimony. When treating of the Pharmacy of alkalis we
said that they were either neutralized in the stomach or had
never been destroyed by diffusion, ... never in practice for
them dissolving the stone if they do they do it in another form
given. Tea and cold water drank early in the morning have
been known to produce the same good effects in removing
the stone, ... not improving this even to have the effect, yet it is
an argument that the blood has a repugnance to Alkalies
and that they are dissolved in the serum and washed out
of the system as effluvia. The urine of a person using
sulfate salts does not discover any alkali in it, ...
the tinges the Symp. of solids grow more viscid with acids.
This proves further that no alkali exists in the blood for
really. But what shall we say to Dr. Huxham that
the Blood is dissolved by the long use of alkalis: would
it deserve that he should have told us the state and appearance
of the blood which he has neglected in those cases
he seems to have drawn his theory from theory and
not his theory of facts. But 2nd Supposing the dissolution of
the blood really happens from the continued use of alkalis
this does not prove that it is occasioned by the Alkalies,
as it might be neutralized by the acid in the stomach
and we know that neutral salts as well as alkalis dissolve
the Blood. 3rd the Alkali may produce diseases by destroying fat
which seems necessary for the formation and composition
of animal fluids. Thus in the Leprosy it is from the abstraction
of this acid from the stomach by the disease of vegetables
whom acid formerly supplied it that the Blood is dis-
solved. All this takes place without any fixed Alkali being
present.



present There is one fact which the favorers of an alkaline acri-
mony in the urine have built much upon. when mixed with
the Syrup of violets it changes it to a green color. But this is a
specious argument and fallacious experiment and must be
immediately rejected by persons who have the least know-
ledge of Colors for the serum of the blood is of a yellow color
and the Syrup of violets blue and we know that blue and
yellow when mixed together produce green. Thus other
substances when mixed with the Syrup of violets which do
not contain any alkali such as Mils and the Yolk of an Egg.
contain any such thing as volatile alkali in the Blood We
now that it contains an ammoniacal salt which is com-
posed of the Volat. alk. and an acid of the phosphoric kind
but what we here mean is whether an volat. alkali exists in
separate state in the Blood Dr Goulin supposes that it
does and mentions round causes which he thinks introduce
it as 1st the use of Vegetables which contain the volat. alk.
such as the Tetra dynamis of deer ucers and the Filago of
Ley, but with me there is much doubt whether they con-
tain any volatile alkali, but if they do contain it in ever so
large a quantity it would be neutralized by the acid in
the stomach before ^{it} entered the mass of fluids or would
be discharged by vomiting stool or perspiration 2nd Dr
Goulin supposes a fixed alkali might decompose this
ammoniacal salt in the blood and thus separate the volat.
alkali. but we before proved that a fixed alkali never enters
the blood and if it did there are no circumstances proper for
a chemical mixture to take place. The same arguments prove
that neither Soap nor Earths can separate this salt
in



in the Blood 2^d Dr. Yonnes supposes that certain aromatic sub-
stances taken into the system and long continued will increase
the heat and circulation so much as to evolve the Volatile al-
kali, but I deny that they are taken in such large quanti-
ties as to produce this effect nor even if they were taken in
large would they tend to decompose the ammoniacal
salt. But again Dr. Yonnes supposes that poisons ta-
ken into the body evolve a volatile alkali which causes
that sudden and universal dissolution of the blood vi-
scent in such cases putrefaction indeed does generate a
volatile alkali but it is not in this way that poisons
act. But from the suddenness with which poisons produce
these effects, I conclude they act by bringing on an atony
of the Nervous system which soon produces a dissolution
or dyscrasia of the fluids, this in appearance is like
putrefaction, it is but momentary and is soon followed
by Death. Something like putrefaction also takes place in
gangrene or Mortification, but if this ever proceeds fo-
rward as to evolve a volatile alkali death is ~~the~~ then the
consequence and the patient ceases to be the object of
Medicine. Our opinion concerning the manner in which
poisons act is confirmed by this viz. that the volatile
alkali has been used with success in France in cases of poi-
son, nothing like volatile alkali would have occurred
in these cases, if there had then would have been no
reason for exhibiting it. And then would have been
more proper to neutralize the ~~poison~~ alkali from
what has been said I conclude that neither the fixed nor
volatile

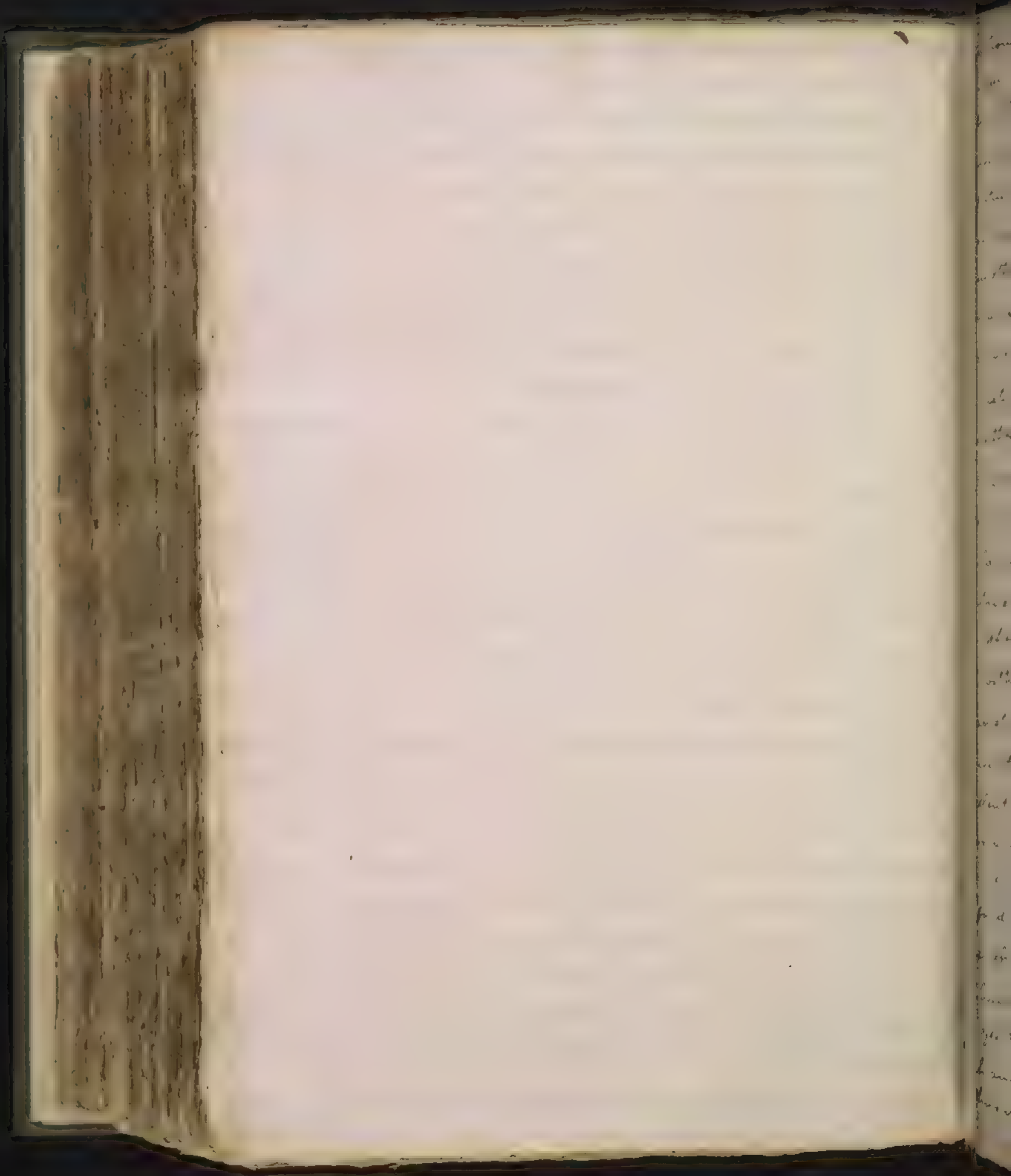


acidic alkalies exist formally in the blood. We would next
to enquire into the presence of neutral salts in the blood
imagine few of these salts exist in the blood. Now are found
naturally most of them being the productions of art. Com-
mon salt is the only one that is taken into the body in
considerable quantities. Dr Boerhaave says he found this
common salt in small quantities in the urine and this
he considers as the cause of that melancholly catarrh
of disorders which the natives know the head of nervous
common. I much doubt whether true common salt was
ever found in the urine. But Mr Morgagni who has pub-
lished an accurate analysis of it tells us he found a salt in the
urine so much resembling common salt that it might
easily be mistaken for it, yet it was essentially different.
Common salt is therefore never formally present in the
blood. By a wonderful process in the animal economy
the common salt is changed into an ammoniacal salt.
We need this process as Glaser long ago showed
how a common salt might be changed into a salt entirely
different from its properties namely Nitre. This method
has lately been used with advantage in the Manufacture
of Salt Petre in France. I infer therefore that no neutral
but this ammoniacal salt exists in our blood the same
have supposed a common salt to exist in it also from
the great quantities of it we daily use, but I have already
told you that it is converted into an ammoniacal salt
which is always present in the urine where we find that
it exists in the blood. It has been called the Essential
salt.



Salt of Urine but might with equal propriety be called
the Essential or Native Salt of our urine. 'It is white'

[illegible]



eruptions owing if not to acrimony either from
an effusion of blood. I cannot think that a robed Pus comes
the fever that generally occurs at the onset of chronic diseases
because as I told you before in fact it is insensible to any
real stimuli. But it may be said how does it happen that
these old ulcers are suddenly dried up that others ~~and~~ ^{and} ~~and~~ ^{and}
as in other places? answer is that in great measure
when an evacuation has continued for a great length of
time by stopping at the balance of the system is destroyed
and nature relieves herself by these eruptions. But whether
now there is no acrimony in the blood is that all the bad
effects of stopping a hemorrhage may be directed by bleed-
ing or purging which must take off acrimony and I
would in a few words recommend topical application
in cutaneous eruptions. When they are venereal use mer-
cury. When from other causes as a Trice Copitis. I attack
them with the Unguent. Merc or Thionium (which has
a narcotic and deadly to them) and give purges or bleed
to prevent Lethargy and its ill effects. There is another
excellent I use viz. Saccaros. Lactum. There is no dan-
ger from using it if not purged after we have bled.
There is another remedy now I am on this subject which I am
very fond of in these cases viz. Vegetable Aliment which
offers less acrimony. To let and of course the same
will have less effect. Medicines can hardly produce
this effect without this. The best liquors may be used for
drink and the patient should take 2 or 3 quarts of P^r Day
and thus it would change the fluids I think.

truly



lately seen very good effects from its use in Ulcers. Dr Wilson
the Apothecary informed us that he used it with very good
these cases. We would now to enquire into the formation of
Pus this by some is supposed to be a secret fluid but it
may be formed without inflammation and Mr Sydenham of
Tunbridge has shown us that Pus may be formed out of the
lymph, he mixing serum with a coagulable lymph in a vessel
almost equal to that of the human body when serum
alone is effused he said it takes place when serum alone
is effused no matter in what place when serum with a co-
agulable lymph is effused, no fermentation Pus is formed
and when along with these Red Globules are effused
gangrene ensues There is only one more substance re-
quired to assist in the Process it is enquired after, the presence
of Morbid matter causing diseases this opinion may be
supported by many arguments and not time to
mention a few will suffice. When we have come often
brought on by frights passions of the mind, in which there
could be no time for the formation of Morbid matter
but they are often cured by extremely bright light when there
could be no illumination of Morbid matter.

We see many fevers cured by medicines which make no
alteration, thus the Mork fever is intermittent

4th When we observe fevers cured, and then our great sweats or
changes at the Crisis of the Urine, then appearances and not
ing to illumination of morbid matter but to a solution
of power or might easily be proved. And solution

5th Supposing morbid matter present in the system in power
it would not produce the phenomena of fevers, for as I have
already
said



recently told you that I was unable to draw & stimulate.

the morbid matter we are told undergoes a concoction and is then eliminated from the system that then shall we say to those Physicians who were weary by the bleeding and purging for these certainly disturb nature in her concoction of this morbid matter. Hippocrates was very fond of leaving the matter to nature and he gave us cases. The left all to nature and his patient died. We observe that those whom proper remedies on the first attack succeed the best.

Next 7th and last I conclude that fevers do not depend on morbid matter, because we can account for all the phenomena from spasm and a weakened energy of the Lymphatic system rather perhaps than from morbid matter. A intermittent fever we may account for in trid exhalations they have supposed that their virus recur into the Blood and produce the disease by entering it. See but the Effluvia are only the Lymphatic cause for they act on the Nervous system as Sedatives and produce a weakened Energy of the Lymphatic system and its consequent spasm which is the proximate cause of fever. It is in this particular that the Disciples of Beavhove and Cullen differ the former calling the morbid matter the proximate the latter the Remote Cause. Another argument for Morbid matter is the violent secretion in the third fever but of this I have spoke already.

Much has been said of ~~the~~ malarial matter because it is
now so common at the time of fevers, and in which they
imagine the malarial matter is concerned. But it
is not the case for beside the arguments to ~~prove~~
it.



that in appearance of sweat and Urine at the Crisis of
fevers are owing to the solution of humors, & might add
that in these cases there is a lovely in the part favoring of
fever. But you will say how happens it that sweating
of the parotid gland occurs at the Crisis these are cold
before of sweat and Urine is out of the mouth of the patient
effusion on the vessels of the part. He answers that in such
of the chemical actions of the animal fluids. Such is the
nature of the human body that its fluids are continu-
ally tending to putrefaction, & excrementation, & it is
which are thrown out by sweat Urine and stool.
Sweat is nothing but a thin water on humors dissolved
it dissolved in it.

Perpiration is a volatile vapor mixed with water, and
air is also mixed with it, there is a surprising variety
in this perspirable matter. Thus by it Dogs discover
their Masters even in the thickest snows. The several
workmen have different perspiration according to
the different duties they are engaged in.

The Urine serves to wash out the excrementitious
parts of the blood that are too gross to pass off by
sweat, the saline parts and whatever is unfit for
nutrition. The Urine contains an ammoniacal Salt and
oil which is suspended in it in the Body, but
unmixed in the form of a cloud upon standing.
The Urine out of the Body is much disposed to putrefaction
when it undergoes the process it evolves this ammoni-
acal Salt whose properties I have mentioned before.

However



However loathsome the Fells may be they have never
hitherto been subjected to the purging eye of the Chemist.
They consist of the foetid parts of the aliment and the bile
with which the Aliment is mixed, on a chemical analysis
an Acid & viscid acid and a volatile alkali is obtained.

We are next to speak of the secreted fluids which are
effluvia of use in the system. I shall by the Mucous of the
Nose Throat Bowels and Utricle &c to speak of the
Synovial liquor of the joints also the Saliva.

The Saliva contains an ammoniacal salt water and
mucous matter. It is apt to congregate on the teeth where
it is called tartar. Dr Hunter used to show a jaw bone
in which the teeth were perfectly covered by it. As I have
mentioned the teeth and perhaps may not have another
opportunity, I shall here mention a disease with which
they are frequently attacked and as it is not commonly
treated of I shall give the method of cure. The disease I
mean is what is vulgarly called the Survey of the
gums. In it the gums roll back and leave the teeth
almost ^{un}covered to their root & roots hence there is frequent
tooth ache. The gums bleed from the slightest touch.
There is but one method of curing it and that is to
necrotize the gums. Run the lancet from one end of
the tooth (in the gum) to the other: they will bleed plentifully
which is of service, there is no pain in the operation
as the parts are almost insensible being
nearly gangrenous. You will be pleased soon after
the part inflamed, the old flesh drops off and new
be



is produced in the proper place. It may be well to give
the Bark internally as the habit is often relaxed and if you
recommend it to your patient a rubric, and under it
it will be of service. In some foreign parts it is
the patient is antiseptic and renders some use. But
Boerhaave talks much of its saponaceous quality. But
we know that there are many other substances that have
the property of forming a bath with water that could
be called soaps.

The next liquor is the gastric liquor. We can get it out
in small quantities to make experiments on. It differs in
quantity in animals according to their teeth. There have
been many experiments concerning digestion which is
different in different animals. It has been shown
many times that in certain digestion is performed
in a different manner. But in a human stomach
it is found by experiment
that digestion was performed by solution in the
human stomach. The solution from the Gas-
tric and salivary juices is assisted by fermentation
which I suppose is necessary in all animals. The dig-
ested Aliment is thrown out of the Pylorus into
the Duodenum, where meeting with the bile the
ferment matters are precipitated and thus being
formed. The bile is proved by experiment to be
neither alkaline nor saponaceous or round has
upon it, it gives by chemical distillation a large quantity
of oil some water, and some spirit. This is the



in production of the case. I am next to speak of the nature
of Milk. It is a white, opaque fluid and is composed of three
elements of the Elements, namely it is composed of three
parts of Cream or oily part, the muciniferous or coagulable
portion and the watery or watery part. The oil and water are
combined by this Mucilage. The oil and water are of a
vegetable nature and the Mucilage is of an animal.
By heat all the watery parts may be evaporated and on
setting it to crystallize and formed which are the
parts of Milk. Left to stand in a warm place and
undergoes a fermentation and evolves an acid. Boiled
milk is left apt to evolve this acid. This perhaps is owing to its
being deprived of air for we know air is necessary to fermentation.
Hence boiled milk is recommended in consumption.
All the Acids coagulate Milk, wine does it on account of its
acid, this coagulable quality is increased by boiling the milk.
The alkalis do not coagulate it, but unite with the butter
forming a kind of Soap. The Neutral Salts, metals and Earths
have no effect upon it. The Stomach of all animals coagulates
milk. The dried Stomach is called Rennet that of calves
is generally used and is employed to make whey. It was
formerly thought to be coagulated by the remaining acid
in the Stomach, but it is owing to the gastric liquor and not
to any acid. This is proved by adding an alkali to milk to be
acted only the Rennet and its coagulating power is not
lost which it would be if it acted in an acid since fishes
also coagulate milk but how this power is so soon as they
are dead. All putrid substances coagulate it. Some
vegetables have this power, thus the flowers of the Artichoke
will coagulate it. We shall now speak of the different parts
that compose milk and 1st of Cream. This rises to the surface
= face

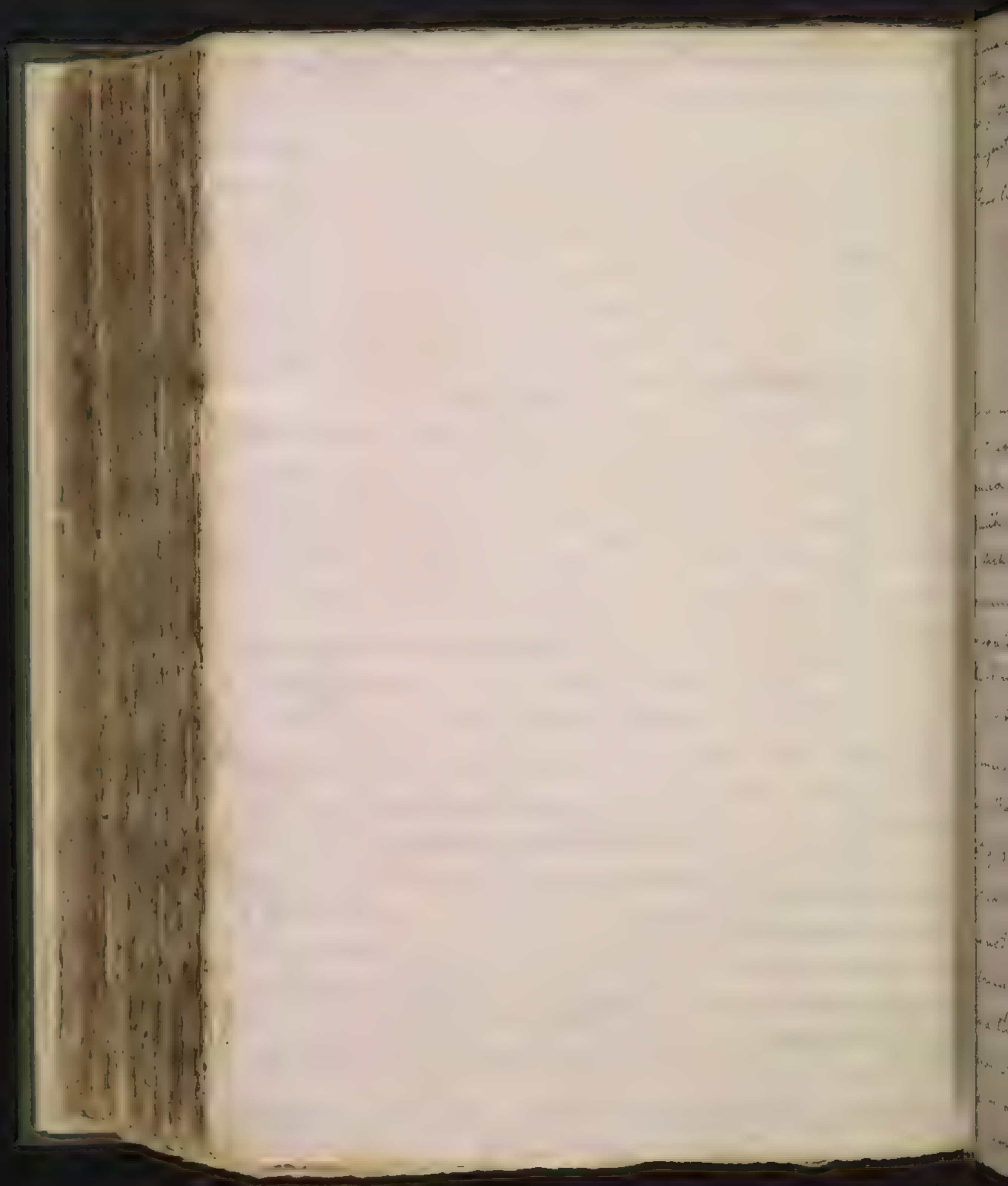


few in an exhausted Receiver or well as in the open air. Neither acids nor Alkalies prevent its operation from the other parts. It will yield most cream when put on butter that have not been longed in the Spring Time because by churning becomes butter. In some countries in England they do not churn the cream to make Butter but only agitate in large tubs. Four degrees of heat are generated by churning this most probably is owing to fermentation. Butter much is mixed with milk in it. Butter is more or less digested in cream, because it is more freed from the mucilaginous parts. Four ^{two} pounds of Milk contains usually four ounces of cream. All cream is not oil and the different qualities depend not on Porture. Thus the Parmesan & Swiss is much talked of is made from the Milk of mountain goats, whose portures are washed by the Po and covered with the finest the richest manure. The cream of this mountain is not so good in any other part of England or in any other country.

The quality of the cream depends on the vegetation that is used. Rennet is most commonly employed than any vegetable called Anotto sometimes used, it only gives a yellow color to the cream.

The quality of the cream will depend on the quality of the Milk and thus in Cheshire the use the whole of it within the country is generally use skimmered Milk. It will also depend on the Method of preparing it. Cream is an unappetizing indigestible New cream is not so but it certainly is not when kept for some time, as it then approaches to putrefaction, or is infected from the Maggots formed in it. The motion of cream assists its putrefaction.

The cream is seldom freed from Mucilage. It contains an essential salt or sugar which may be got by evaporation.



ture and crystallization. The nourishment more milk is according to the quantity of sugar it contains. The following proportions of the quantity of sugar in the Milk of different animals may assist us in their exhibition.

| | | |
|--------------------------|---------------|----------------------|
| Four ounces of Asps Milk | - - - - - 84 | } grains of
sugar |
| of Human | - - - - - 64 | |
| of Mares | contains - 70 | |
| of Cows | - - - - - 54 | |
| of Goats | - - - - - 49 | |
| of Sheep | - - - - - 35 | |

Milk is used in 6 circumstances if the stomach will not bear it you may add water to it and its good effects will be produced. You may give Cows milk to nourish as much as Asps milk by adding loaf sugar to it. The animals which of Asps Milk are either frumivorous or Carnivorous therefore are ruminating and not ruminating. Of the ruminating are Cows Goats and Sheep. The others are Human, Asps and Mares. We shall now treat of the different kinds of milk. Goats Milk resembles Cows. Sheep's milk is different as it contains more of the mucilaginous parts and is coagulated by Spirit of Wine. Womans milk is not coagulated by acids, but by a heat of 86° and in Childrens Stomachs it is coagulated. It contains a great quantity of cream. The milk of Women is not altered so much by diseases as has been imagined for a Child has been known to suck the milk of a woman who had the Lues venerea without receiving it. For the Child receives it, it must have a sound mouth. But Opinions of the mind so affect it. Hence in Improving Children for the milk pox it will not be of any use to give medicine to



to the Nurse? It is diet only that can do anything here. ... as Milk
is not very assent when coagulated the whey floats in the Milk
The Milk is much affected by diet, thus a child fed on fruit soon
more alkaline much sooner when fed on sugar &c. as is the
origin of milk I am inclined to think it is secreted from the Glands
for the quantity given by some nurses and by cows can never
be secreted from the Blood. But further, Milk is secreted in
and Blood is necessary to putrefaction always giving out
off for a volatile & Chlorine Matter imparts a red color to the
milk this is owing to the oil the (microscopic) is seen
in marrow in the bones and in the milk.

The use of milk nature teaches all young animals to take
it immediately from the breasts. This should teach us to
use it unmedicated before the volatile parts exhale
Bony Blabber which is a spontaneous separation of the
parts of the milk more volatile than milk. The Laplanders
use this as a condiment to their diet, to prevent the
ill effects from the animal food. In the Consumption it
is a good practice to weaken it with water. Some con-
sumptive patients have their Stomachs so weak as not to
bear it unless diluted, for as Dr. Cadogan observes people used
with diet most when they can bear it least that is they
then require a diet of easy assimilation, there is as much
truth in this aphorism as in any in Physic. It may be
given at first largely diluted with water and we may
proceed by degrees to pure milk. Too much cannot be said
of the use of milk in Consumption and I have now
more



more Coughs and Colds cured by a milk diet than by any other means. In all chronic diseases attended with Plethora a milk diet is necessary, but it should be entered on with caution by Plethoric people and never no after 40 years of age. I have seen apoplexies and Cramps in the Ptomachyion not observing this caution. The 40 is generally the age in towns at which people will not bear milk yet in the country some will bear it at 50. A Milk diet is very useful in the Scury and in all cases of diminished perspiration and cutaneous eruptions. Milk has been used in Cases of poisons when it is supposed to act as an oil, by enveloping the poisons and sheathing the parts from its corroding. Here it should be taken in large quantities immediately after the poison has been swallowed.

Nervous Affairs

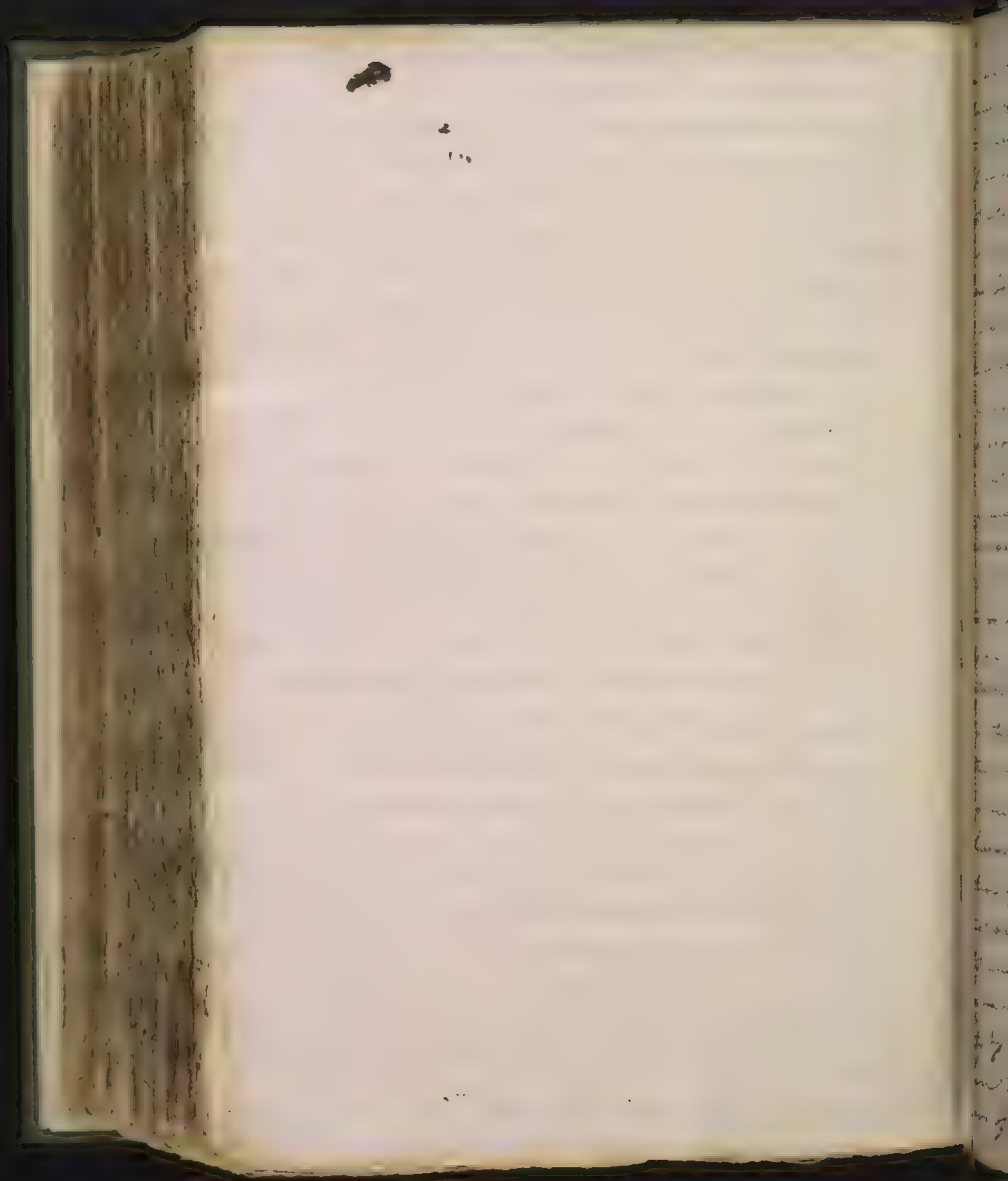
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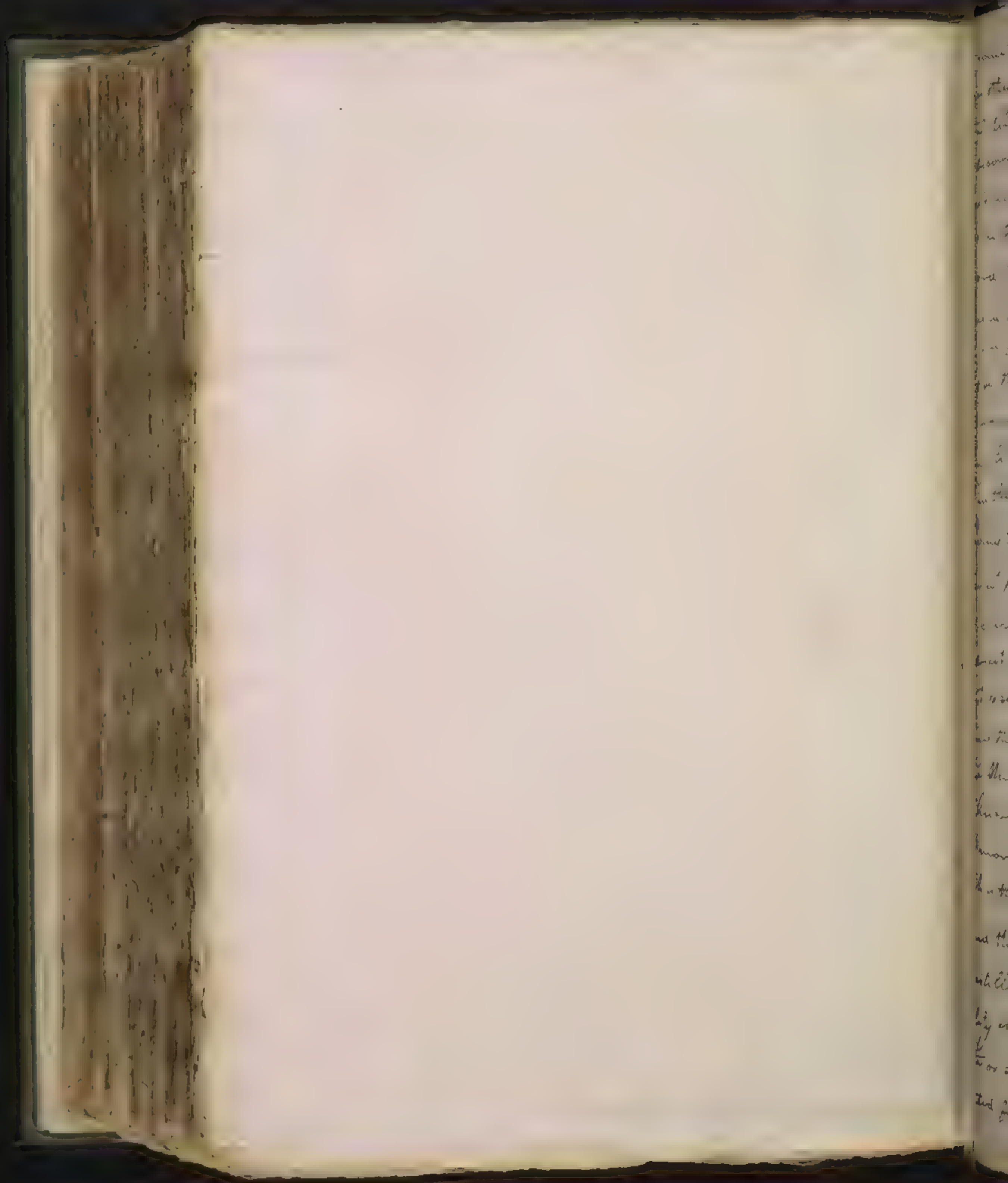
Fig. 1. A view of the surface of the earth without being
enriched with the great variety of plants & animals there. The
variety of vegetables is indeed innumerable and they all differ
from each other in their fruits, colour &c. to say nothing of
as plants like animals they are produced from original
seeds which are unchangeable in their nature thus one
seed if planted in soil will produce the same kind of tree
that it did immediately after the creation it contained
the parts of an oak in its acorn. Much enquiry has been
made into the nature of plants. Vegetables are
nourished by a matter like animals which it assimilates
to its own nature, this nutritious matter from its fluid
nature has been called Mucous, it is water in which most of
the ingredients of plants are contained Vegetables have
whining vessels by which they draw in moisture and
nourishment from the elements. They imbibe moisture
from the earth by their external surfaces
as well as their roots they all breathe in proportion
to the quantity of moisture that they imbibe. By pluck-
ing off their leaves the life will they absorb and the
will they breathe the same vessels which imbibed nourishment
contain a degree of heat necessary for vegetation. In general we may
observe that plants will not grow in a heat above that in which
sea water will continue to flow or that at which it is gentle-
ly stirred. The mercury is at the freezing point in
water and in a mixture of this kind. There is to be the
only



only indigenous means of *Cobalt* minerals they must be worn
and it is not so much as other vegetables or to their long term
very slowly and abundantly with our which serves to defend them
from the soil. The mineral seeds are preserved in cold climates
owing to the quantity of oil they contain. Those trees whose leaves
fall off during the winter are probably indigenous to warm
countries. It is not likely that any plants of this roots
were not below the surface of the earth. The moisture is necessary
to the growth of plants, yet too much is harmful. Hence the best
soil is one in dry seasons and in dry sandy soils and vice versa
you will also from hence understand why in the North of
Europe the fruit is better and why several trees grow best
along the sea coast & others planted in frozen ground, but
the great moisture is carried off and prevented coming in
contact with the root when growing the root of a tree is
in the soil. It is necessary in the root to increase the quantity
and of it to the leaves. The quantity of moisture
evaporated by the root. It is now generally thought that there is
a circulation of something like blood in plants, but this we
know in the following reasons. There is no communication
between the vessels which imbibe and those which discharge
the excrements appear 3rd It is not necessary that there
should be an apparatus for the circulation of sap, which is
not analogous to blood this is the same in all animals
It is different in different animals, in some it is thick
in others thin, in some it is sweet in others bitter and in some
acid. But 4th The figure and distribution of the vessels of plants
unlike the vessels of animals they do not ramify. The broad
sides of the vessels proceed in parallel straight lines and when they
appear



and I am convinced it is only a separation of the different juices, but the
vegetation thus are, I only seem to be divided into distinct fluids and the
solvent liquors which have been absorbed may be observed in separate
rates since Water is to plants what blood is to man and it contains
the principle of nourishment materially. As the original stem
shoot into fibres as they return their original figure ever afterwards
thus some plants grow back which makes the roots, branches and leaves
green because thus or, I know, the bark is purely fibrous
and from it the nourishment of plants is derived This is proved
in the following experiment if we cut a piece of Bark out of
the wood in its place, but a thin plate over them (the piece of Bark)
which was taken out over it in two or three years after we shall
find that this hole has sunk into the wood substance a distance
of an inch or more whether the nerves are tubular or spongy But the
most important argument in support of a nervous system, I know
that, is the involuntary this is found in many plants in which
involuntary functions there is nothing peculiar to them some de-
pend on the presence of a nervous system in plants, the name
of irritability is more proper than sensitive as we cannot be
certain that plants possess sensation. We should next enquire
into the circulation of Sap in plants. This has been supposed
to be owing to capillary attraction, but we cannot admit
the supposition as the nerves are not tubular and as the
motion of the Sap does not follow the laws of capillary
attraction. I would rather ascribe it to the influence
of light and heat upon them driving the Sap to every part
for we have shown they have nerves and consequently irri-
tability by their nerves they have a sensibility to the Rays of
the Sun. This will extend our ideas of the invigorating
powers of the power of day which not only renews life
in



in some animals or trees I have a view but even just gives rise to
it in others, he gives activity and verdure to the vegetable world
then all plants have a partiality for heat and light, now or
whether observed derive the life to the different parts of
plants, hence we can understand why the branches of
trees in this country spread towards the South East and
South West, but so true is this observation that the in-
dians in America use it as a guide instead of a compass.
1. Sun-flower which has the strongest partiality for the sun
light the English green houses generally opened towards that
part from which the light proceeds. The green color of plants is
owing to their attracting and fixing the rays of light, they lose
this in the dark may not all the variety in the colors of plants
be owing to their attracting and fixing the rays of light in
different proportions. This was Dr Hales's opinion. The soil
and climate influenced them greatly Dr Hales tells us that
the driest soils afford plants of the richest and most ele-
gant colors may not this be owing to their attracting &
fixing the rays of light in different proportions. Dr
Isaac Newton leans to this opinion or may be seen in the
30th lecture subjoined to his treatise on optics. We have
one more principle with respect to vegetables to mention
which is that they will not grow without the contact of
air and that they yield a pretty large quantity of this
by distillation. Some plants have their appearance and
quality changed by being transplanted to another cli-
mate or soil as the Thorn Bush which by being trans-
planted from the woods into the garden loses all its
thorns



... of the change. Thus one unchanged in any climate, the
the water below comes to equal perfection in the cold regions
of Siberia as in the sunny Gardens of Italy. Herbs yield by
a biennal analysis Water, oil, air, Earth, & charred Matter
abounding with the $\frac{1}{2}$ and salt ~~the~~ or simple salts which
on acid and alkali and neutral salts, the alkali may be
obtained from some without coming in the action of fire. The
productions of vegetables in their native state are oils, (olive
the oils of Balsams and mucous oils) gums, resins, gums
Ingors and Pomina. By the salts oils and resins we have
various properties. The gums are instances which are ~~various~~
insipid, moderate, ~~insoluble~~ in $\frac{1}{2}$ and oils but soluble
in Water. The gums are poured forth in a ~~solid~~ ^{soft} form and
hardened by exposure to air, they are useful in Pharmacy &
by these means we may unite oil and salts. Sometimes
the gums and resins are combined. Opium is of this kind
then we know from their ascending from the plant in
a milky form and dissolving only in proof spirits. Here the
spirit dissolves the resin and the water the gum & will
not dissolve gum. Resin is not only not soluble in water but little
water ingor has been used, called a salt but it is not
soluble in water, which is an essential property of a salt
and it is liable to fermentation which salt is not. It
explodes when thrown into the fire, that and its fermenta-
tion is owing to its fixed air. It is soluble in $\frac{1}{2}$ when warm
but when cold is deposited when the spirit becomes
cold. It is soluble both in warm and cold water. It is
highly antiseptic and preserves animal substances from
Autrefaction



infusion it is very nutritious and the Basis of nourishment in the
greatest Plants being nutritious in proportion to the quantity of sugar
they contain as an example of nourishment sugar turns at sum-
mer 1 Oil 2 Mucilage 3 all our aliments contain more or
less of these substances. It is observed that in the coronas and
ring sugar the negroes grow remarkably fat probably from
drinking this time almost wholly on sugar. In winter sugar
is got from the juice of the sugar cane. The juice must be boiled
until it deposits the sugar, then should in a little interval of time
be taken the expression and heating of the juice or it is rendered
unfit for use and the next progress is towards granulation
which presents the granulation. The Negroes who are well
acquainted with this Circumstance frequently spoil the
whole boiling of it by touching the milk in which it is
ground with lime or lemon juice which sets the whole
to working. The Sugar cane is not the only plant that
affords sugar, the Maple the Birch and the Hickory Tree
each afford it also, it also abounds in the Indian corn.
Rocks in carrots Parsnips Beets &c. The Maples which grow
in the hills afford it in largest quantity. It may also be easily
procured in warm weather by covering the Roots with
snow. Eleven Gallons of this juice will yield one pound
of Sugar. The Indians when about to make a journey
mix this Sugar with an equal quantity of flour prepared
from green Indian Corn parched over the fire, by mix-
ing a little water with it we obtain a pleasant agreeable
food, this if even taken in a small quantity yields
a great proportion of nourishment. Sugar may be
obtained



drawn from the other plants in which it is contained by throw-
ing them in warm & which extracts and dissolves the sugar and
when cold deposits it. The Maple not only yields sugar but
the wine vinegar and an excellent spirit.

Farina is like sugar in some respects. It is disposed to fer-
ment yields a spirit and vinegar and is soluble in warm
water than in cold. It is contained in the seeds of some
plants and in the roots or fruits of others. The Cereal yield
it in greatest quantity. It is somewhat remarkable that the
Cereal is never found wild. Perhaps the Farina
we get is owing to culture. Perhaps all the Cereals
were originally of one species and all the variety we
now may be owing to the change of climate and soil and
to culture. We are next to speak of fermentation. This

refers to be a gradual intestine motion of the component
parts of an heterogeneous mass with the solution of several
is and generation heat. It is distinguished from efferve-
scence by the extrication of the gas being gradual. During
fermentation a turbid matter is seen which goes to the
bottom as soon as the fermentation is over. Heat and
moisture and heat are absolutely necessary to fermentation.
The degree of heat requisite is between 40 and 100. Moisture
is so necessary to fermentation that sugar will keep one
hundred years in a dry jar without fermenting altho it
is so extremely liable to ferment. The different stages of fer-
mentation require different degrees of heat of moisture. Heat is also
necessary or too much motion arises in rapid fermentation
or hinders it on too rapidly. Fermentation is divided into
three stages the Vinous Acidous and Putrefactive. It



It is during the known fermentation that the generation of fixed air
and effluvia are more copious. Thus during this stage
much heat is sometimes generated as a candle to break out
into flames or for instance in Hay stacks. During the action
of heat is generated and life moisture is necessary and in
the putrefaction there is an entire ^{down} abstraction of heat. Thus
a great whale will putrefy without the appearance of heat
the least degree of heat (its failure is even so that light
~~wood over its luminous appearance~~) that is not necessary
to putrefaction. Moisture alone is sufficient, thus a piece
of wood being wet will become rotten. During putrefaction
a gas is always escaping, it is to this that light wood
over its luminous appearance, the vapor that is dis-
charged is sometimes inflammable, thus we have in-
stances of ships being set on fire by bringing the flame
of a candle too near the vapor escaping from rum ke-
ls fermenting in a Hoghead, a vapor of this kind
is discharged from Bilge water which carries
Sles and Paint. When vegetables undergo these three
stages of fermentation if left to themselves yet they may
be brought about quicker by substances called ferments
Thus yeast brings on the known fermentation & so does
as does the Acetous and a putrid Matter will bring
on the putrefactive Fermentation These facts admit of
great application. I would here propose a question on
animal Substances capable of undergoing the different
stages of fermentation. I have tested an acid in a piece of
of
wood.

[Faint handwritten notes or bleed-through from another page]

young Beef. Two hours after dining solely on animal food
I vomited up a liquor which was evidently sour and which I have
changed a thin vegetable infusion to a red color. Wool is an
animal matter and as we before observed the generation
of heat is solely confined to the vinous fermentation, yet
new pulled clothes will take fire when exposed to dry: how
can we account for this phenomenon? but from its
undergoing a vinous fermentation. The acidity perceived
in flesh may be owing to a part of the vegetable matter by
which the animal was nourished not being properly
~~and~~ assimilated. If the vinous and acetous fermenta-
tions do take place they are not uniform and but of short
continuance. It is indeed difficult to determine whether
they do take place; but it is probable that they do. Do all
vegetables run thro these three stages? yes they do altho
the progress may be different in different vegetables: those
which contain most sugar continue longest in the vinous, those
which contain most mucilage proceed most quickly to
the acetous and putrefactive. Those Wine that contain the
most sugar have the strongest body Fermentation is
checked by

- 1st too much or too little heat
- 2nd By salts
- 3rd By visciduous earths.
- 4th By volatile acid of sulphur
- 5th By Electricity or Thunder and Lightning
- 6th By too much motion.

We come now to speak of those mixtures in making
which fermentation is commonly employed. Bread.



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Bread. This is made either of Wheat Rye Barley &c. and Maiz
is the most natural food of man and I never heard of
not one man who does not find it. It is either leavened or
unleavened. The leavened Bread which is made of water
flour and some salt is the most ancient it is baked on an
oven. It was with that leavened bread that Abraham entertained the Angels
in the Valley of Mambrath, this is probable by the cir-
cumstances with which it was prepared by Sarah in the
lives and savages still use the unleavened bread. We
are indebted to accident and Economy for the discovery
of leavened bread which made of flower water and yeast
is leavened. It was probably found out by some fungal
Housewife who unwilling to lose the last scrap of a loaf
was baking it mixed them with yeast flour and has been
improved to find her bread lighter and better flavored instead of being hard
this was, probably, the origin of leavened Bread such a discovery
once noticed remain concealed, it spread rapidly thro' the
world. The use of it must have been very ancient we find mention
made of it in so early an age as that of Moses in after ages yeast
was discovered and used as a ferment. Yeast is the common name
where it is in our use its mention is general, and in
a, a number and answers better than the name of Bread is
made leavened Bread in some parts of Scotland in the West
use minims but in general water was used in the bread in
then in rolls which are the lightest kind of Bread and made in
this manner 10 half a bushel of fine wheat flour add ten
eggs, one pound and half a pound and as much yeast as
is sufficient, they must be well kneaded & kneaded with
the hand



new milk instead of water, before they are baked with sugar
over with new milk in which an Egg has been beat up. The
best that is used for baking the bread should not be long kept
to, in order to avoid any sourness. It is common as a general rule
to add a small quantity of yeast to the new milk and a small
quantity will raise it as well as any other yeast. There
is an opinion lately broached in London that bread is
injurious. It must however be seen that many more people
eat bread where there is a marked acidity but not others
There is a disease in London bread and it is not new
but, and the cause of it, is a very malignant fermentation
which it may do harm, but it is not a small quantity
and this quantity is much reduced in the foreign markets to
be seen in the same. And how many nutmeg
and barley facts do we daily take down in our drinks
The same is to speak of drinks made by fermentation, and
now I must premise that mankind universally make
use of fermented liquors than had ever been deposited
from its original simplicity as in food than he did the
same with regard to. Drink and improved wine & milk
is much better than water as Wine, Beer, spirit &c. In Asia
they prepare an intoxicating liquor from the juice of the
tree called the Arach and from Rice in South America
a liquor is prepared from Maize by fermentation with
saliva. The West Indians use a liquor prepared with
from Sugar. In Europe the Vine distills a liquor for
the use of its medicinal qualities. The Tartars contrive to
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street & spirituous liquor now obtained which when it
has grown sour. In a word so great is the delight of man to
water that there are some nations that quench their thirst
by sucking the blood of living animals particularly the goats
rather than partake of that salutary fluid which flows
to them from every part thro' the Umbilic of Nature. One crime
generally produces another. No sooner had man begun
to satiate his appetite with animal food than fermented
liquors became necessary to counteract its ill effects. Intem-
perance in eating produced a necessity of temperance
in drinking. When ^{had} no more foraken the limits of the earth
than he sought & obtained from every part of nature to
when his food still more savory; such drinks then become
absolutely necessary as abound with an acid and a vegeta-
ble matter capable of correcting the putrefactive tendency
of the food. Liquors that we shall treat of is.

Beer - This is prepared from different grains in different
countries, we generally prepare it from barley in this
country and it is also prepared from barley in Europe in
the following manner. Barley is first soaked in water
for 3 or 4 days till it grows soft so that we can squeeze
a pulp out of the grains. These grains that float on the
surface of the water are thrown away being light and rotten
it is then laid in heaps till it vegetates or germinates, by a
gentle fermentation it gets a sweet taste and its form
is changed into a Sugar, after which it is dried in a kiln
and then ground, it is now called Malt. It is then put
into a large Copper vessel to boil with a sufficient quantity
of water which extracts its sweet or saccharine matter
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this is called mashing or masking in Scotland. In the pre-
paration of the Beer we should attend to the quality of the
water, river and Pond waters are the best and to be preferred to
spring waters. The superior excellence of the London Porter
is owing to the impurities of ^{the} Thames water. The better Beer
is its superiority to being made at a time of the year when
the River Thames abounds most with impurities of animal
and vegetable nature. We may judge of the impurity of the
Thames water from what is said by Dr Smollett in his
Humphrey Clucker he observes that human Excrement
is the least filthy and least disagreeable substance that
it contains The heat should never exceed 120° of Fahrenheit
Thermometer It is now called Wort. Hops or some bitter herb
is now added to prevent the acetous fermentation. Worm-
wood is sometimes used but it is neither so fragrant nor so
agreeable as hops. It is then after some time put into a long tub
or cooler to cool and then into water to ferment after this it
is barreled or bottled I have nothing to add concerning the
use of Beer in medicine, but that it is improper in acidity
of the stomach. Porter has been substituted in its place in some
cases. The predominance of the Bitter over the acid is so great
in Porter, that those bad effects do not follow from the
use of it and it is often used to great advantage by its
bitterness it braces the stomach and prevents the Beer
from undergoing the acetous fermentation. The next liquor
Wine Of its antiquity we have high accounts both in Scrip-
ture and in the profane Writers. In one part of the Scripture
it is said to comfort the heart both of God and Man The Phi-
lippians



insphere and the Ports of all ages shew in its juices But
I shall leave this to be observed that all Wines are originally of
the same ^{species} ~~materials~~ however diversified by climate culture
or soil. The quality of the Wine is much altered by these cir-
cumstances, those that grow in warm climates are sweet
and less astringent than those that grow in cold climates. They
are also diversified in their quality by the time and manner
of preparing them. The best wines are made from the unripe
tender grapes and the sweet from grapes fully ripe and even
some what dried. Sacch is made from dried grapes and
derives its name from the french word Sec which signifies
dry. The mode of preparing also influences wines. Thus the
white and red Burgundy are made from the same grapes.
The white flows spontaneously or runs off by a gentle pressure.
The red owes its color to the skins of the grapes being forc-
ibly pressed out with it. This color is afterwards heightened by
coloring substances or Red wood or dyes. The color is not
only heightened in this wine by these red substances, but
also in other wines. The juice after it is pressed out and before
fermentation is called Must. It is now put in a warm
place where it ferments when the fermentation is over
it is bottled up and after some time is fit for use. The
fermentation in wine is stopped in the first stage of it
the vinous fermentation and sooner in proportion to
the quantity of Sugar the wines contain. The weak wines
or such as have but little Sugar are most apt to run
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on to the acetous and thus to be perked as it is called. This acetous fermentation is commonly stopped by Brandy, which prevents the evolution or destroys the acid after it is generated but the addition of Brandy alters the quality of the Wine, the best method of restoring them from this acetous fermentation is by increasing the quantity of saccharine matter in them or rousing that which is already present into action. This is done first by exposure to the Sun which is often done by the wine merchants: to understand how it operates we must observe that all the saccharine parts do not ferment at the first fermentation a good deal is deposited with the ferment parts. The heat of the Sun raises them and sets them fermenting and changes the unfermented must or saccharine matter into wine and thus destroys the beginning acidity. 2nd Method of rousing the saccharine matter in wine and thus preventing the acetous fermentation is gentle motion hence Sea voyages do so much good to wines, they are better when they have stood some time for being agitated and carriage will have more effect in improving wine than even a Sea voyage. The foreign matters introduced to bring on the vinous fermentation are vegetable or animal matters. The vegetable are either a portion of unfermented must or a quantity of Sugar. I have heard an old Madeira merchant say that the best wine he ever knew came in a Sugar Ship. These Pipes of wine that lay either above or below the Hogs being brought a higher price than the same pipe of wine that came in the same ship this appears to be owing to the wine absorbing the sweet effluvia of the

Sugar



of the fungus, it is not peculiar to wine
it appears on beets with turneps or is frequently seen in the neigh-
borhood of this city. The upper receives its name from the
turnip or to be very disagreeable. How to easily told
how this effluvia of vegetable matters in wheat puts forth
How then should under a Walnut tree. The animal matters
on the back and sides of Beef when our old problem recurs
upon us, the color of Beef is commonly said to feed the
wine, does it undergo a various fermentation or does it absorb
an alkali which neutralizes and destroys the acid of the wine
or fort as it is formed. The former is the most probable suppo-
sition, all animal substances are organic, composed of
vegetables and cannot exist in their nature until the
expression in the scripture that the Flesh is grass is true
not only in a metaphorical but a literal sense.

Wine may be fixed 1st by Heat 2nd Mechanically or by Lavoisier
or a sheet of brown paper 3rd Chemically by Alkali Milk or Lime
To fix them very down the tartar matters to the Bottom.
As to the analysis of wine it is composed of ardent spirits
water a vegetable acid and a certain quantity of Must.
The nutritious quality of wine depends on the quanti-
ty of must it contains, the stronger wine are more nour-
ishing than the weaker as they contain a greater propor-
tion of must or saccharine matter. Madeira then is the
most nourishing of the wines, they may perhaps be classed
with Madeira after them are Port, Sauternes, and
then after them Cotes; then Champagne and
Burgundy. The most wines may be classed with Madeira
in point of nutritious quality of this kind are
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recurs.

[illegible]

and sack.

Spirits are light inflammable bodies. These & heavier & proper as mentioned before, they are produced from Vegetables which are in the various fermentation and from them only and may be obtained from any vegetable capable of undergoing this fermentation. Spirits are obtained from the maize app as from the ground the grain which grows in old worn out ground and in dry seasons yields more spirit than that which grows in new ground or in wet seasons. The spirit we shall treat of here is called Rum and is procured from Melafus. The Melafus is brought from different Islands possesses different properties and as the distillers call it very hot, that is so fermenting very readily when it comes from Surinam. Barbadoes and Jamaica whilst that which comes from Hispaniola ferments more slowly this owing to a greater quantity of lime being employed to distill the liquor. In Surinam they use a Vegetable alkali which does much to the fermentation. To 100 Gallons of Melafus add 300 of water and 400 of rum (what returns we shall explain presently) let them stand in a tub for 8 or 10 Days till they are completely entered into the various fermentation. This will be in a longer or shorter time in proportion to the heat of the Melafus. The liquor is then to be put into the still and from 800 Gallons you will obtain from 100 to 105 Gallons of Rum and sometimes more. What remains in the still is called retin and is to be let out by a cock on the back part of the still it is a true vinous ferment. To procure the fermentation still more add two or three Buckets full of the liquor made yesterday yesterday, if the fermentation is backward we may add a little yeast lees of Wine or what will answer better a little powder of Yeast. When the fermentation proceeds too rapidly it may be checked by air in or by rubbing the sides of the tub with Soap. Strong spirit may be obtained by distilling rum.

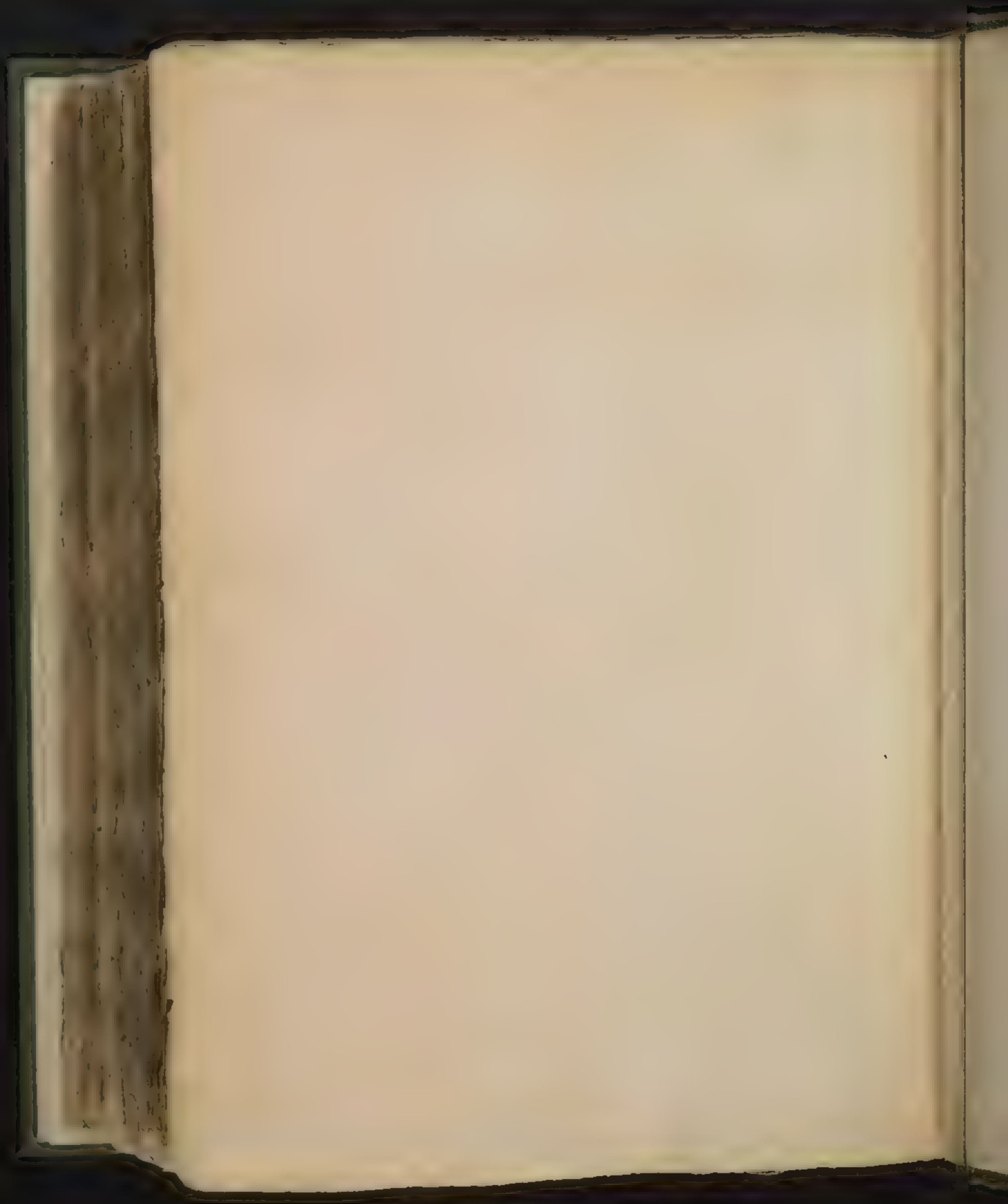
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Run two or three times The best test of the strength of spirit is the Hygro-
meter.

Vinegar may be made from any vegetable capable of undergoing
the acetous fermentation. In England they make Vinegar of
Beer in France and Germany from wine and in this coun-
try most commonly from cider. In a barrel of cider we add
a gallon of dilute sulphuric vinegar and by
Mellin's process which is frequently used in wine - some



















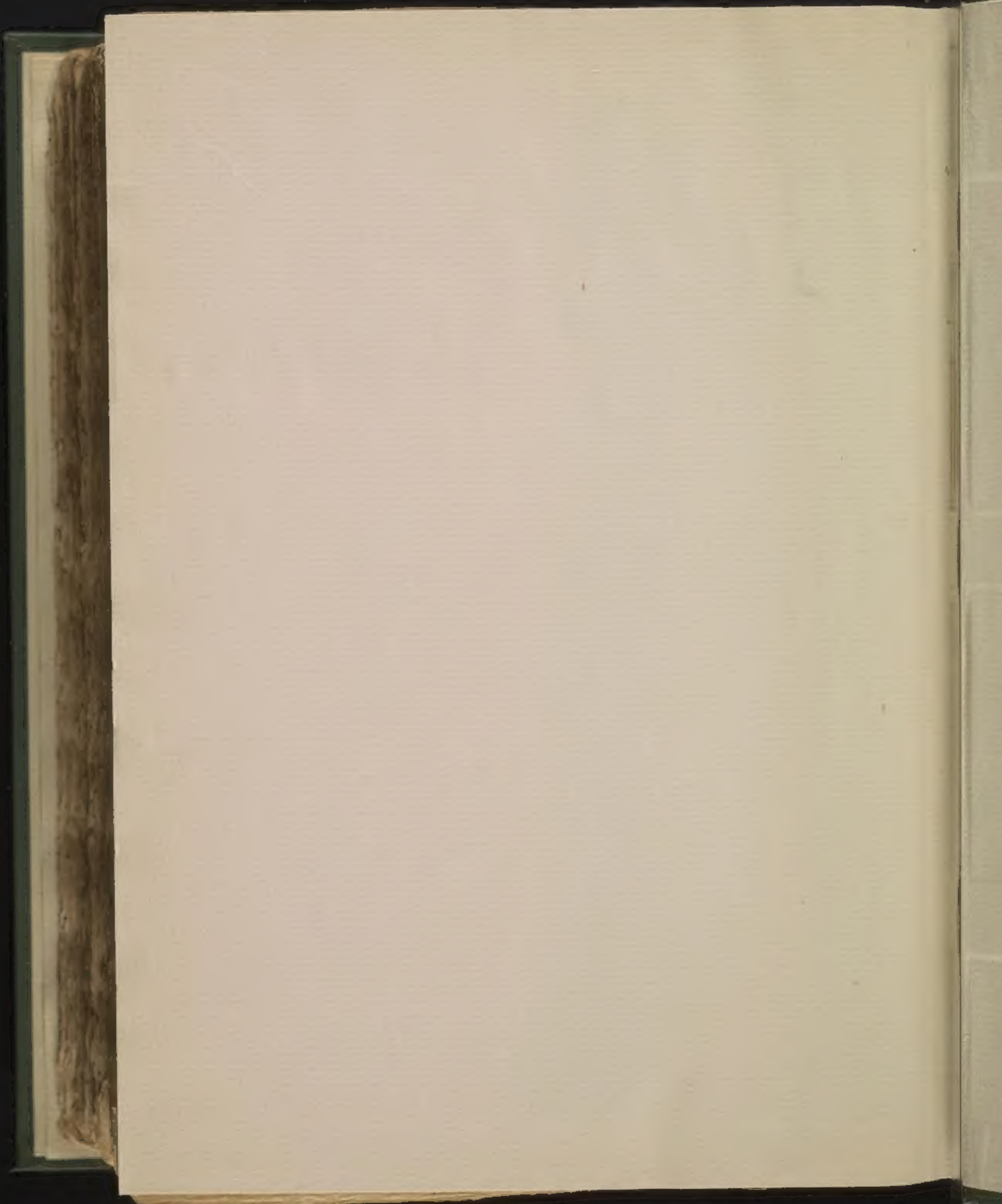




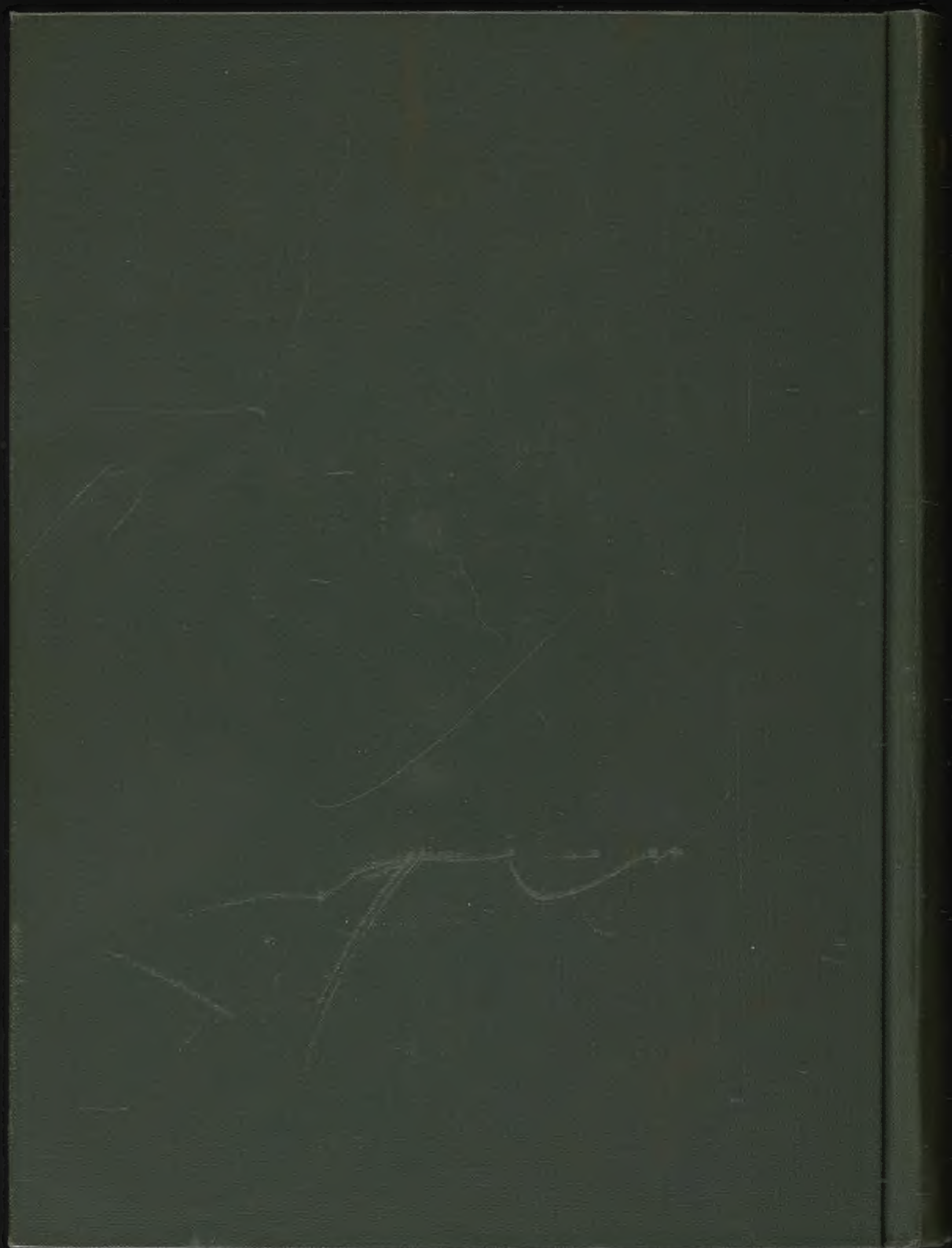








1855
1856



R U S H



LECTURES ON
CHEMISTRY